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THE TRIPARTITE DIVISION OF EDUCATION

THE tripartite division of education is of ancient date and wide currency. It is found in the writings of Plato and Aristotle, and was practically carried out in the schools of both Athens and Rome. Comenius, who was perhaps the first modern writer to work out an articulated systems of schools, made four divisions, including the school of infancy or the mother's lap;[1] and since his time the threefold scheme, not now counting the school of infancy, has become established in all progressive countries. These facts point to the conclusion that the tripartite scheme has at least been found convenient; and also raise the question of the basis on which it rests. Of course the divisions actually worked out in different times and places differ widely in themselves.

It is a common remark that the historical development of education has been from the top downwards, and not from the bottom upwards. The university, which originated in mediæval times, is the oldest existing type of Christian school. Now Latin was the vernacular of the universities for several centuries,

[1] See Professor S. S. Laurie's *John Amos Comenius*, p. 131. This is the complete scheme:

"1. Infancy: — the mother's lap up to six years of age.
"2. Boyhood: — *ludus literarius* or vernacular public school.
"3. Adolescence: — the Latin school or gymnasium.
"4. Youth: — the University (*Academia*) and travel."

the student's preparation for entrance being such command of the language as enabled him to take the lectures appropriate to his rank and to carry on the commerce of university life. This preparation was obtained in grammar schools, which were often, but not always, found in connection with the cathedrals or collegiate churches, and which appear to have been an outgrowth of the monastic and episcopal schools of an earlier time. While the instruction given in these schools was graduated to the needs of the scholars, it does not appear to have been divided into primary and secondary stages.[1]

The modern elementary school was slow in appearing, and for a very good reason. Experience proves, what might indeed have been seen beforehand, that elementary schools, as we understand them, could be developed only on the basis of a vernacular culture. In no country can the multitude be brought up on a foreign language. Even the three national languages of Switzerland are vernacular to those who use them, not exotic tongues. Comenius very significantly called his common school "the vernacular school." But the old grammar schools were Latin schools. As a body, the humanists took little interest in popular education, and the Jesuits have been often censured for confining themselves almost wholly to secondary education, thus passing the masses by. The fact is that the humanists and classicists of early times had no ideals, no education-material, and no ped-

[1] It may be stated with some confidence that at least in the later Middle Age the smallest towns and even the larger villages possessed schools where a boy might learn to read and acquire the first rudiments of ecclesiastical Latin; while, except in very remote and thinly populated regions, he would never have had to go very far from home to find a regular grammar school. That the means of education in reading, writing, and the elements of Latin were far more widely diffused in mediæval times than has sometimes been supposed, is coming to be generally recognized by students of mediæval life. The knowledge of reading and writing and of the elements of Latin was by no means confined to the clergy: "The bailiff of every manor kept his accounts in Latin." A grammar master often formed part of the establishment of a great noble or prelate, who had pages of gentle family residing in his house for education. In other cases a boy of well-to-do family no doubt received his earliest education from a chaplain or "clerk" of his father, or from a private tutor or neighboring priest engaged for the purpose.— Rashdall, *The Universities of Europe in the Middle Ages*, p. 602.

agogical methods with which they could reach the common people, and so they were necessarily excluded from the field of elementary education. Even Luther, who did so much to promote popular education, both by its direct inculcation and by translating the Bible into the vernacular of his country, thus furnishing education-material, insisted on putting Latin, Greek, and Hebrew in the schools before German. The fact is, there was no possibility of making education national and popular, or of building up a system of elementary schools, until the hold of the classics had been partially broken; but just as soon as men in large numbers came to value vernacular culture, the modern elementary school gained a foothold, which has become firmer and stronger from that day to this.

But our subject is, the basis on which the tripartite division of education rests. Is it to be sought in convention merely? Is the educational course like a railway connecting Chicago and New York, which is cut up into divisions merely for convenience in management? When you say that A, B, and C are severally receiving a primary, a secondary, and a higher education, do you mean merely that they have reached different stages on a road that has the same prevailing character throughout? Again, does the division rest on the need of society for a hierarchy of equipped workers,—the need of men and women of different degrees of education? Do we mean only that the primary school is for the many, the secondary school for the few, the college or university for the very few? Or, finally, are we consulting the necessities of those who practice the teaching art? While something can be said for each of these views, they are all superficial. They can be answered in their own terms; but it will be better to answer them by including them in a profounder view of the subject.

The thesis that I propose is this: The tripartite division of education, and so of schools, is based on fact and reason; or, more definitely, it rests on the nature of the education that is furnished, or that should be furnished, in elementary, secondary, and higher schools.

A short departure from the direct line of thought may here be excused. The existing school systems of even the best educated countries, to a degree, rest on tradition and convenience. In the gymnasia of Germany, the colleges and lycées of France, and the endowed schools of England, as well as in the high schools and academies of the United States, there is considerable elementary teaching. The German, French, and English schools referred to take their pupils at from nine to twelve years of age. Possibly, also, higher instruction may sometimes be found in these so-called secondary schools. The main point is this: Elementary work does not become secondary, or secondary work higher work, because it is done in a so-called high school or college. For, if the tripartite division of schools rests on fact and reason, then the work done, or the teaching, must give character to the school, and not the school to the teaching. From this point of view it is easy to define the three kinds of schools: Elementary, secondary, and higher schools are schools in which the teaching, or instruction, that gives them their real character is elementary, secondary, or higher instruction, as the case may be. The school is defined, as other things are defined, from its prevailing or characteristic features.

We must remember also that the child's education begins in the school of infancy, and not in the elementary school. Here the child acquires the elements of all knowledge, or at least of all kinds of knowledge. In contact with the natural world, human society, and his own mind he finds the keys to universal instruction. In the school of infancy, too, are found the rudiments of all language culture. Here the child acquires a store of language, as well as a store of facts and ideas. The great Sclavic Reformer contended that in the school of the lap the elements of everything necessary to the building up of the life of man may be obtained.

These things premised, let us return to our question: What are the characteristic marks or notes of the three great divisions of education respectively? We shall find them partly in the things that are taught and partly in the methods of teaching

them ; or, to put it in another form, in the kind and degree of mental exercise and growth that are produced. In other words, the tripartite division of education rests upon three groups of psychological facts.

The elementary school is plainly marked off from the school of infancy, on the one hand, and sufficiently so from the secondary school on the other. Here the child finds the elementary school arts,—speech, reading, writing, drawing, composition, the elements of arithmetic, and the like. These are arts, not sciences ; tools for carrying on study, not studies ; means, not ends. While they add something in themselves to real knowledge and discipline, the great reason for teaching them is the necessity of equipping the mind for future work. These arts give the elementary school its primary character. In the elementary school, also, we meet the elementary studies proper,—language, literature, history including civil government, mathematics, and science. It is important that the studies of the elementary school shall include all the great divisions of knowledge. Here again the idea of equipment is found ; the pupil is to be furnished with knowledge that will be useful for guidance in life or for information, and also be trained in methods or habits of acquisition, so that he can go farther on the same road, whether in the secondary school or in the school of self-cultivation. As Comenius put it, our duty is to instruct all human beings in all those things that have to do with human affairs. He mentions the moralities, and says mutual serviceableness should be promoted and the disposition to over self-appraisement be suppressed, or, in the words of Professor Laurie : "The vernacular school ought to teach all that would be of use for the whole of life, and this to all." So much for subjects ; now a few words in relation to method. Method is as characteristic of elementary teaching as subject-matter itself. Nor is elementary method, or the method of elementary teaching, difficult of discovery. Do what we will to develop the higher intelligence of children, elementary education will always bear the plain stamp of memory and so of empiricism : the child cannot as yet deal with great logical constructions, or

trace out with care the relations and interdependencies of things. Besides, as has been shown, a store of material, to be used both for itself and as apperceiving centers, must be laid in. Still, elementary school work should not concern itself wholly with the memory, or be altogether empirical. On the contrary, it should, as far as can be consistently done at this stage of progress, energize all the powers of the mind. It is a period when perception, memory, and imagination are particularly active. Such an education as has now been described will qualify the pupil to take his own place in society, and to do intelligently the common work of the world.

So far there will be no difference of opinion. The next step may lead to disagreement. The foreign languages are arts, quite as much as the vernacular tongue, because they are the keys to their respective literatures. What is more, the memorizing of words and forms of words belonging to a foreign tongue, and the translation of simple sentences, are as much elementary work as the similar processes in the vernacular. Furthermore, while algebra and geometry are counted secondary studies, the algebraic notation and simple constructive geometry are purely elementary.

The secondary school marks a stride forward in two main particulars. (1) Although the student will long continue to become more skillful in their use, we may now consider that the arts of the elementary school are mastered. He has been put in possession of the tools of the student's trade. The same may be said of the elements of foreign languages, if they are taught in the elementary school. (2) The range of real study is greatly increased: old studies are followed farther and new ones are taken up. The fields of literature, history, and politics are more fully cultivated, mathematics is pushed on to the algebraic and geometrical stages, while several of the sciences of nature are pursued a certain distance. The study of grammar and rhetoric give an introspective view of the mind itself. While the secondary course is somewhat encyclopædic, still its note is discipline, or development, rather than the attainment of any

particular kind of knowledge. Properly speaking there is no specialization. To look at the subject from the side of the mind, or the faculties, memory is less prominent than in the elementary school, the thinking faculties more prominent. Accordingly there is less empiricism and more thought. It is a stage of limited generalization. The secondary school deals with the relations existing within groups of facts, rather than the relations that bind groups together; the time for philosophy has not yet come. The geography, history, and elements of science taught in the school below have been called "fact lore;" the corresponding studies of the secondary school, more developed, should be real sciences.

Higher instruction is not concerned with school arts, but is wholly occupied with real subjects of study. It develops the powers of the mind, but its note is knowledge rather than discipline. The assumption is that the student has been set on his feet, and that he is now able to get on somewhat rapidly and independently. The higher schools are the place for specialization, so far as specialization is conformable to general culture. The tools of acquisition have been put into the student's hands, and he is now expected to use them. Text-books and lectures are still prominent, but room is also made for research. The library and the laboratory assume a new prominence in the life of the student. The knowledge *that*, as the Greeks called it, is still valued, but less highly than the knowledge *why*. The student searches for things and for the unity that is in things. It is the period of surveys, views, explanations, generalizations, and laws. The student is introduced to philosophy.

Perhaps it will be said that this is only an ideal construction — that a scheme closely following the lines drawn does not exist in any country. The following observations may therefore be submitted:

1. The three divisions of education are not wholly discontinuous, like the compartments of a ship; they pass into one

another, as in all cases of organic growth; still each division has its own distinguishing marks. At the same time there is good reason to think that the transitions are made too suddenly from one class of schools to the next higher one. Particularly is this true of the passage from the elementary to the secondary school. As a rule this is the case in respect both to studies and methods, and the fact accounts in a measure for the large shrinkage of the number of high school pupils in passing from the first year to the second one. Many pupils are not able to bear the strain that new studies and new methods impose. It would be far better if the change began to come as early as the seventh grade. In that way time would be saved, and the rigor of the later sudden transition would be mitigated. Comenius proposed that the child should pass out of the vernacular school at the age of twelve years.

2. While it may be true that no existing scheme of education closely follows the lines laid down, all modern schemes conform to it in a general way. Such divergences as exist do not disprove the practical reality of the division, or show that it is useless.

3. A division of education is one thing, an organized system of schools quite another. Even in countries where general ideas most prevail, as Germany and France, the school organization, as has been stated, rests partly on tradition and convenience, and not wholly on pedagogical principles. Neither will it be found practical, perhaps, to make a school system conform strictly to pedagogical principles. But the fact that some secondary work must be done in the elementary school, or some elementary work in the secondary school, is no reason for not sharply discriminating the several kinds of education or teaching.

4. We must not be led to deny the reality of the tripartite division because the names of schools do not always correspond

to the work that is done in them. Elementary teaching is often found in secondary schools, secondary teaching in both elementary and higher schools. The character of the work done in any case must be determined by an examination of the work itself, and not by looking at the name of the school as printed in the catalogue. An institution is not, pedagogically speaking, a university because it happens to bear that name.

5. The secondary school may be so called whether we view it from above or below. Originally it was much more difficult to adjust it to the school below than the school above, but at the present time the fact is the other way.

6. Holding tenaciously that the tripartite division is founded in fact and reason, and not in mere convenience, we may still conceive an intelligent difference of opinion on the question where dividing lines should be drawn. Nor is there any reason why different adjustments of studies may not be made at different times, but quite the contrary. In truth, outside the school arts the question is not so much the name that the study bears as the work that is done under the name. While it is plain that the algebraic notation and simple constructive geometry are elementary work, it is equally plain that some of the arithmetic found in the elementary text-books is secondary work. Literature and history present every one of the three stages of study, and so do many of the sciences.

7. There is now considerable interest felt in the optional introduction of so-called high school studies into the grades below. Latin and German have already been subjected to this experiment in some schools. Interest in this experiment is likely to grow. As has been shown, the first stage of these languages is purely elementary work. Furthermore, it is desirable for pedagogical reasons to begin foreign languages at an earlier day than is commonly done. It is well known that Latin is begun much earlier in Germany, France, and England than in the

United States. Why should we not profit by the example of those countries? No doubt there are difficulties growing out of the peculiar organization of the public schools, as well as difficulties inherent in the nature of society. It is more difficult to forecast the future of an American child than it is the future of a European child. Still, the administrative difficulties can in a degree be overcome, while the number of American children whose future can be forecasted with a reasonable degree of confidence is sufficiently large to warrant the experiment that is now being made.

B. A. HINSDALE

UNIVERSITY OF MICHIGAN

SECONDARY EDUCATION

At the meeting of the National Educational Association in 1895 the Department of Secondary Education attempted to secure the registration of those present teaching in high schools and academies. The reception committee at the headquarters of the department were repeatedly surprised at the number of high school teachers who asked for explanation of the words, "Secondary Education," on a sign in the reception rooms where they were requested to register. Strange as it may appear, the term was wholly new to numbers of them. Yet it is familiar enough in educational literature. The United States Commissioner of Education has devoted considerable space to Secondary Education, under that specific title, since 1871; and since 1887 there has been such a department of the National Educational Association. These words, however, even yet convey little or no meaning to the general public, and but a vague one to large numbers of teachers.

The period of secondary education, if we define it by subject, overlaps the elementary period below and the college period above, and this fact alone accounts, to a considerable degree, for the lack of an exact connotation. The attempt to begin in the elementary school certain subjects, formerly reserved by custom to the high school or academy, without careful analysis to determine in what measure they properly belong to both, is also responsible for added indefiniteness in the use of this unfortunate word. But the admirable discussion of the relation of elementary to secondary education by the "Committee of Fifteen" fixes as clearly as is possible the line of demarkation as regards both matter and method, and amply suffices as a theoretical guide for what may be safely attempted in practice. There is, however, danger of an assumption on the

part of the public that elementary beginnings in science, mathematics and foreign languages may suffice for a more specialized treatment of the same subjects in the secondary school. The only justifiable hope is that such beginnings may make it possible for the pupil to grasp readily and firmly a more advanced discussion of the same topics and make more rapid progress in them. Indeed the marked characteristic of the secondary school should be a more highly specialized and intensive study of the subjects pursued, keeping pace with the student's growth in years and understanding.

In an ideal scheme of education, even disregarding the question of specialization of instruction, the years that mark distinctively the ripening of the child into manhood and womanhood should be assigned to secondary education. For we know that at this time we are to look for the budding of tastes and capacities which, failing at this time of careful nurture, may wither without fruition. The years from thirteen to eighteen rather than from fifteen to nineteen, from the view point of the physiologist, would better mark the secondary school period.

That this whole period be brought within the watchful observation of a single institution of uniform discipline, I believe to be of vast importance for the preservation and development of the strongest and highest aptitudes of individuals. That this is largely possible of attainment appears from the statistics of secondary schools in Dr. Harris' last report. In public secondary schools, showing an enrollment of 232,950 pupils pursuing the ten characteristic secondary school studies, there were also enrolled 436,855 students. The corresponding figures for private secondary schools were respectively 96,147 and 64,180. The natural tendency everywhere is to unite the eighth grade with the grades above, where the latter are weak in numbers, and I believe it would be helpful to secondary education if this were always done.

But the distinctive feature of secondary education, as distinguished from highly specialized professional training of the

university, is its general character. An analysis even of commercial courses in high schools shows that the work most markedly specialized is very general compared with the work of the expert in any line of accounts. In manual training courses the fundamentals are those of the general high school courses in mathematics, science, and English. The distinctive feature of the manual work is its general training, being in fact general preparation for those who may later specialize along some technical line. I believe it quite as much for the interest of the state to secure to the future cabinetmaker or machinist general skill in handicraft along with his general view of the field of knowledge, as the more extended general education now furnished to the future doctor or lawyer.

A most significant fact regarding secondary schools, especially the public high schools, is the tendency to speak of them and to regard them as colleges for the people. The title often has a more far-reaching significance and a sounder basis in reality than the one who uses the term in local pride can grasp or understand. We need but recall the usual age of graduation from the best American colleges half a century ago to see that, as regards the maturity of their students, the high schools have in a marked degree stepped into the place of the colleges of those days; and that the colleges by raising the standard of admission and by greater specialization of work have moved upward out of their way. In the best class of high schools and academies much of the work of the last year stands side by side and compares favorably with that of the freshman year in college. It is becoming a matter of pardonable pride to high school principals to point to those of their graduates who have anticipated by examination freshman and sophomore studies in American colleges of high standing. Some of the subjects in which this is possible are physics, chemistry, biology, solid geometry, trigonometry, French, and German. Colleges and universities may do much to raise the standard of the high school and to encourage a professional spirit in its teachers by acknowledging this fact and by allowing extra courses that may be taken by a high school stu-

dent above the minimum amount required for admission to be counted towards the A.B. degree. I know of no movement that would go so far to solve the vexatious problem of the relation of secondary school, college, and university as a mutual understanding and agreement between colleges and secondary schools in regard to this matter. The following seems to me to indicate approximately the relation of educational periods in an ideal scheme of education: Elementary, four to twelve years inclusive; secondary, thirteen to seventeen; college, eighteen to twenty; professional or university, twenty-one to twenty-three. Remembering that the average age for entrance at the colleges of Oxford University is seventeen, and that the A.B. degree is granted at twenty, it would seem as though the attempt ought soon to be made to unify the requirements for that degree in our own land.

Is not the time come for a vigorous attack on this and its kindred problems? A vast system of public elementary and secondary instruction, growing yearly more efficient and more ambitious, supported with a loyalty and generosity that no other national institution receives, needs to have its ideals vitalized and encouraged by comradeship with the traditional ideals of the higher education. It must be a real comradeship without suspicion on the one side or patronizing on the other. The mightiness of the struggle to leaven our American democracy with right feeling and right judgment, that the ballot may prove an instrument for the increase of truth and righteousness and not a tool of tyrannous might for their destruction, ought to leave no room for petty feeling about place or rank in this common cause. Signs are not lacking that one of the strongest bonds of national unity is our educational system; for there is no place in education for sectional feeling, for partisan struggles. Active and able organizations exist for the discussion of the problems proposed. The Departments of Higher and Secondary Education of the National Educational Association are already at work upon one. We scarcely realize the power at our disposal in the four great associations of colleges and preparatory schools,

known as the New England, Middle States, North Central, and Southern. The machinery for their interaction and coöperation has yet to be devised, but committees have been appointed looking to this end.

There must, however, come a fuller realization of the principle, that no institution liveth unto itself. During the recent convention of the National Educational Association, a meeting was held of the representatives of these various associations. A professor in one of the oldest and strongest of the southern universities afterwards remarked: "When the southern association was formed, our University did not think best to join. I believe we made a great mistake. Institutions with traditions should not be chary of their presence at these gatherings. If your traditions are worth something for universal use, share them freely with the younger institutions; the giving is not likely to be altogether on one side." Another illustration from the Buffalo convention will suffice to indicate a contrasted spirit, which I believe to be too common. A professor of almost our oldest university described it as a national institution, drawing its students probably from a wider field than any other American university; yet, almost at the same time, he stated its system of entrance examinations was determined simply and absolutely by the course of study decided upon by the university for the freshman and sophomore years. It seems to me that no institution can with justice regard itself as national, unless it shows in its standards for entrance a sympathetic consideration for the problems of secondary education, as they exist nationally, and a certain readiness and willingness to adjust itself to them. The president of the youngest American university also treated the subject of methods of admission. He stated that the university was prepared at its own expense to examine schools; if approved, to make their teachers, in a sense, examiners for the university, to read all papers offered by such teachers from their classes, and to give certificates to successful candidates, whether they desired to enter that university or not. He furthermore expressed the hope that ultimately one plan, one standard might be adopted

by which any boy might enter any college he desired. Is not the latter the spirit that should characterize every American college—a willingness to do everything in its power to increase the number of those seeking higher culture, so far as it can be done without detriment to the standards of sound scholarship?

WM. H. SMILEY

DENVER, COL.

WHAT CONSTITUTES A SECONDARY SCHOOL

LETTER FROM PROFESSOR JAMES E. RUSSELL

INVESTIGATION in the sphere of child psychology, tends to show that there is a decided change in the interests of children sometime about the twelfth or thirteenth year of age. Up to this time the child is acquisitive ; he seeks to add to his store of knowledge and to his stock of possessions ; he makes collections of birds' eggs, postage stamps, campaign buttons. Apparently his sole enjoyment is in the getting, rather than in its results. At about the age of twelve or thirteen, however, there appears the tendency to ask the all-important question, What is all this worth? He begins to seek the meaning of what he has done. He becomes, in short, speculative, philosophical. The child lives in a world essentially realistic ; the world of the youth is essentially idealistic.

Contemporaneous with these changes in the mental life are the momentous physiological transformations which mark the beginning of the adolescent period. The individual comes into his inheritance, an embarrassment of riches, the acceptance of which involves weighty responsibilities. The important pedagogic consideration is the enormous accession of physical and psychical energy. What shall be done with it? This question the educator must answer. Failure to recognize that a new era has dawned in the history of the individual will inevitably result in the fruitless dissipation of this priceless store or its expenditure along lines of doubtful benefit to all concerned. It is especially the duty of the secondary school to recognize the peculiar interests of the adolescent period and so to direct the expenditure of youthful energy that good may come instead of evil.

Our social order demands that every child shall be the better enabled through schooling to master his environment. The

school that does not leave its pupils better equipped for their life-work by reason of its teachings is unworthy of public support. The secondary school is no exception, it, too, must fit for life. But the theory — unfortunately in the ascendancy at present — which prescribes for college admission high school courses which are intended to give in four years a well-rounded, practical preparation for life, I believe to be thoroughly unpedagogical and utterly impracticable. It is impossible to devise a course of study for the high school which shall be at once the best possible preparation for college and for life. Pupils enter the secondary school intending to continue their studies for periods varying from one year to ten years. Will anyone say that the first four years of a ten years' course gives the best possible preparation for the future life of the high school graduate? On the other hand there is something wrong when a course of study naturally culminating at the end of four years is continued beyond that limit. On one theory alone can such things be explained, viz., that one and the same mill can grind out cooks and preachers all equally good. But this is no place to discuss the doctrine of formal discipline. In my opinion the American secondary school must go on multiplying courses (most likely by offering more elective studies) until every boy, and especially every girl, may find a course of study adapted to his or her peculiar needs, both in content and length of time.

The American secondary school, therefore, can recognize no distinctions of class or sex; it is for all who choose to enter therein. It cannot be defined according to length of curriculum; some of its courses may be only one year in length and others may extend over six or eight years. Secondary education properly begins at twelve or thirteen years of age; it lasts until such time as the individual is able to take up independent work, whether it be in domestic life, in the trades, in business, or in the university. It includes, in my judgment, the last year or two of the grammar school, all of the high school and a part of the college work. This is not saying that the high school should maintain courses of six or eight years in length; certain practi-

cal considerations must obviously be reckoned with in solving that problem. But it is evident that from the beginning of the period of secondary education to its end, there must be observed the strictest continuity both in the kind of work and the methods employed.

The secondary school, as I conceive it, is clearly differentiated from the continuation school, the technical school, the trade school, the commercial school, and all institutions of similar nature. It aims at the interpretation and unification of knowledge as well as its mere acquisition. At the same time it should give the youth the ability to use his knowledge for his own advancement, and the good of others. Neither a liberal education, nor formal discipline, nor yet practical training, should be the exclusive aim of the secondary school, but rather all these combined. Its highest aim is a liberal education by means of a discipline more or less formal, in order that the individual may be the better prepared for his life-work.

JAMES E. RUSSELL

UNIVERSITY OF COLORADO,
Boulder, Colo.

LETTER FROM PRESIDENT SCHURMAN

DEAR SIR: — I have been considering your proposal to draw up a statement of what I mean by secondary education. I have concluded that it can be done in far fewer words than you suggest.

First, it may be defined according to age. Secondary schools are those whose pupils range from fourteen to eighteen. The name applies to all schools whose teaching is intended for pupils of such age, whether they are called academies, or commercial, manual training, or technical schools.

Secondly, it may be defined from the standpoint of the work done. Secondary schools are those whose courses end where college courses begin. In saying this, however, misapprehension must be avoided by adding that allowance must be made for the standing of the college. The grade of work is such as is out-

lined in the report of the Committee of Ten, where the phrase Secondary School is used as equivalent to High School or Academy (*vide* tables on pp. 34-35 and also tables on p. 37). I have hitherto used the phrase, myself, to mean just what the Committee of Ten have made it mean by their use of it in their report. The only exception is that it may be made to include the grammar school as well as the high school, and is currently so used I should consider either a correct use of the term. Most logically it includes grammar-school work. It is only historically, owing to the report referred to, that the application of the phrase is restricted to the high-school grade, and I notice in more recent educational reports that grammar schools are now usually included.

The function of the secondary school is indicated in what I have said. It is to take pupils who are through the elementary, or "three R's" grade, and provide suitable education for them until they have reached the proper age for entering college, namely eighteen, and have had a school discipline equal in bulk to that required for entrance to a reputable college.

Very truly yours,

J. G. SCHURMAN

CORNELL UNIVERSITY
Ithaca, N. Y.

NOTE BY DR. MACKENZIE

UNTIL recently it mattered little what term was used. Certainly fifteen or twenty years ago preparatory education was not thought as important as it is today. The great increase in the salaries of the teachers of our fitting schools warrants the above statement. The public is coming to see that quite largely and finally the *direction* of a pupil's intellectual life is determined by the secondary school. Naturally, then, a more precise and uniform term should be set apart to describe this department of work, and I hope the editor of the REVIEW may get the subject successfully before the proper public.

The Scotch-Irish of Ulster, and the Scotch alone who "kept"

wonderfully good schools in Pennsylvania, Delaware, New York, and New Jersey, used quite uniformly the term academy and spoke of their college preparatory work as *academical*. In New England this stage of work was described by the term "fitting." A real Yankee always speaks of Exeter and Andover as "fitting schools," though he also calls them *preparatory* schools. Our most inconsistent and objectionable term is "High School." A "primary" grade should lead up to a "secondary"—it would seem—if regard is to be paid to sequence in terms and historical analogy. The effort now so hopefully begun by the Committee of Ten to articulate the public high schools to the college and university, calls for greater uniformity in writing and speaking of the educational work that is just below, or preparatory to, college work. There is a gratifying agreement in the use of the word that describes our higher education. American college connotes a perfectly definite grade of work and while the world laughs at our "university," it very generally respects our college. Then, too, the country over, we know what is meant by a primary or a grammar grade. But just between the grammar school and college we have:

1. "The Academy" (Scotch Irish),
2. "The Fitting or Preparatory School" (New England),
3. "The School" (English),
4. "The Secondary School" (French),
5. "The High School" (United States),

all appointed to do collegiate preparatory work. To add to our confusion and absurdities, manual training and commercial schools are now describing their work as "secondary."

It is an open secret that our older colleges are disposed to relegate more and more of freshman and sophomore work to the preparatory schools, and in this way to compel them to take on more of the character of the German Gymnasium, the French Lycée, and the English "School." In other words, after America has had sufficient experience with her present costly and wasteful system, she will reach the same conclusion British and Continental people have reached, and commit to the "Academy"

or "School" all merely disciplinary work, and end the long drawn farce in which our boys and girls pass from the increasingly large number of princely teachers of our schools to the increasingly large number of inexperienced tutors of our colleges.

But meantime we must have, as all civilized people have, an exact, uniform word or phrase, to describe this culminating stage of mere pupilage and discipline. The words "Primary," "Grammar" are historically and educationally good. They will never be changed in America. Do they not call for the third, Latin-French term "Secondary?" The acceptance or adoption of this word would permit the use of the very desirable word "School." Then the American gradation in term would be a happy, consistent, and descriptive one, "School," "College," "University."

JAMES C. MACKENZIE

LAWRENCEVILLE, N. J.

COLLEGE ADMISSION REQUIREMENTS IN MATHEMATICS[1]

IT will be seen from these tables that the diversity in the requirements for admission in mathematics to the sixty colleges and universities here represented is considerable. Within the three subjects most prominent in the tables the diversity is greatest in Geometry and least in Arithmetic. In Elementary Algebra, owing to the difference in the arrangement of the subject-matter in different text-books, the requirements are probably not as uniform as they seem to be, and there are some obvious differences.

REQUIREMENTS FOR ADMISSION TO THE A.B. COURSE.

Arithmetic. — Of the sixty colleges represented in the tables, twenty-eight have at present an admission requirement in Arithmetic, and this requirement is so nearly uniform that it may be said that these twenty-eight colleges make substantially the same requirement in that subject.

Algebra. — Nearly all the colleges require a knowledge of Algebra through Quadratics. Some specify Indeterminate Equations, and Logarithms, and some also add the Binomial Theorem, the Progressions, Indeterminate Coefficients, Permutations and Combinations. These additional requirements are, however, not made specifically by any considerable number of the colleges and universities represented in the table. Many of the colleges indicate a certain portion of a given text-book. In such cases, it is, of course, possible to determine exactly what the requirements really cover. Making a comparison of all these requirements, it appears that the phrase *Elementary Algebra through Quadratics*

[1] This paper is properly a part of the Preliminary Report of the Committee on College Entrance Requirements which appeared in the June SCHOOL REVIEW. The tables referred to will be found there.

practically covers the admission requirements in Elementary Algebra for nearly all the colleges whatever the text-book used may be; for, although the arrangement and scope of the subject in different texts are not uniform, yet the deficiencies, in most cases, would be slight.

Geometry. — The greatest diversity in the admission requirements in any one subject in Mathematics appears in the requirement in Geometry. Of the sixty colleges represented in the table, thirty-nine require Plane Geometry alone; nineteen require Plane and Solid Geometry, and two institutions (the University of North Carolina and the University of Tennessee) require no Geometry whatever. Of the institutions that require Solid Geometry, two require "to the sphere" only (University of Rochester and Beloit College). Three colleges, viz., Lehigh University, Rutgers College and Washington and Jefferson College, do not require all of Plane Geometry. One of the colleges (University of Iowa) accepts Plane Trigonometry in place of Solid Geometry. Some of the colleges indicate special texts without qualification. Most of the colleges, however, merely indicate the scope of requirement without specifying a particular text.

Trigonometry. — Three colleges require Trigonometry in addition to the other requirements in Mathematics if the candidate offers no Greek. One college requires Trigonometry or Solid Geometry as well as Greek and the other requirements in Mathematics also (Johns Hopkins). These four institutions require Plane Trigonometry only. One college requires Plane and Spherical Trigonometry as well as Greek, together with the other requirements in Mathematics.

Analytical Geometry. — One of the Universities named (Johns Hopkins) requires either Analytical Geometry or Elementary Mechanics. But as pupils seldom go from secondary schools to Johns Hopkins this particular requirement has very little to do with the present discussion.

REQUIREMENTS FOR PH.B. COURSE.

Only two of the institutions named in the table, viz., University of California and Yale University, specify different requirements in Mathematics for this course from the requirements for the A.B. course, the difference in the case of these two institutions being, for the University of California, certain optional requirements in Algebra, Solid Geometry, and Plane Trigonometry with practice in Logarithms; and for Yale University the additional requirements comprise Series, Theory of Limits, Properties of Logarithms, Compound Interest, Annuities, Solid Geometry, and some work in Trigonometry in addition to the Trigonometry required for the A.B. course.

REQUIREMENTS FOR B.S. COURSE.

Eighteen of the colleges named specify different requirements for the B.S. course from the requirements for the A. B. course. One diminishes the requirements slightly, Higher Arithmetic being omitted. In all the other colleges the requirements in Mathematics for the B.S. course are somewhat higher than for the A.B. course, the additional requirements being usually Trigonometry, or Solid Geometry, or both. In some cases also the requirement in Algebra is increased. Of these eighteen institutions, ten require Solid Geometry alone in addition to the requirement for the A.B. course. One permits an alternative between Solid Geometry or Trigonometry. One specifies only one book of Solid Geometry in addition to the requirements for the A.B. course, and one specifies only two books of Solid Geometry. Six of these institutions require both Solid Geometry and Trigonometry in addition to the requirements for the A.B. course. Two of them require both Plane and Spherical Trigonometry. In other cases, when Trigonometry is required, Plane Trigonometry only is demanded.

It will be seen from the foregoing summary of the facts revealed by the table, that the difference in admission requirements for half a dozen colleges taken at random from the table,

is considerable, and that the burden imposed upon a school fitting for several colleges is, in consequence, also considerable. This great diversity seems wholly unjustifiable. A school preparing for several colleges ought to be able to adjust its programme economically as well as efficiently. When the difference in the requirements made by two institutions is so great that one of them requires Algebra and Plane Geometry; and another one insists on both Plane and Solid Geometry, and perhaps also on Trigonometry as well; and a third institution requires Arithmetic as well as Geometry and Algebra, while the other two do not, it is clear that the secondary school fitting for college is required to adjust itself to demands that impose needless burdens. To state this fact would seem to indicate that the time has come when the colleges should agree on some plan of admission requirements in Mathematics that shall satisfy them all by means of reasonable substitutions and omissions.

PAUL H. HANUS

HARVARD UNIVERSITY

THE BUFFALO MEETING OF THE N. E. A.

DEPARTMENT OF SECONDARY EDUCATION

IT would be easy to exhaust the vocabulary of superlatives in describing the Buffalo meeting. The arrangements for the material welfare of the association could not be surpassed; neither could the weather, nor the attendance, nor the programme, nor the spirit. No one who attended that meeting can ever again be at heart an educational pessimist.

The programme of the Department of Secondary Education was printed in full in the June SCHOOL REVIEW, and certain prophecies were there indulged in. But the prophetic gift had not descended fully upon the writer at that time. Rarest of events, the programme was carried out in full, just as printed, only one speaker who was to take part in the discussion being absent. President Harris' management set the standard for business method, efficiency, courtesy, and sociability. Never has such a representative body of secondary teachers come together, in such entire sympathy, simplicity, and earnestness before. Never have the workers been so much in evidence, and had such a fair show. There was an amazing lack of telling us how to do it by people who had never done it themselves, and an astonishing amount of testimony as to how they had done it by those who had. Counted by numbers, the attendance was very large; tested by quality it was much larger. Most notable of the addresses was that of President Schurman of Cornell on "What is a Secondary School?" Most notable of actions taken was the unanimous adoption of the Preliminary Report of the Joint Committee of the Departments of Higher and of Secondary Education, published in the June SCHOOL REVIEW, together with the same committee's plan of work for the coming year (see p. 541). This committee, all but still-born at Denver, is today the livest thing in American education. The absence of the chairman of the committee, Dr. A. F. Nightingale, who was in Europe, was universally regretted. Everyone was interested in

the work of the committee, and the Department of Science especially took hold magnificently. Dr. Palmer, the new president, will see to it that the committee has all the help it can hope for from that Department.

The meeting was distinctly practical and progressive. It was ready to put itself on record, and eager to do something. But there was no eagerness to do anything rash or ill-considered. The action of the joint meetings in unanimously adopting the Report of the Committee of the American Philological Association on Latin (see SCHOOL REVIEW for June 1896) without the slightest opposition in debate was very significant. It means much when the stand taken by a body of specialists is such that it can be so heartily endorsed by a convention of working schoolmen.

The two new features of the programme proved wise and helpful innovations. These were the Round Table Conferences, and the joint meeting of the Departments of Higher and of Secondary Education. The Round Tables caused embarrassment, because it was hard to decide which one to attend. But ultimately each teacher brought up at the place where his heart really was. The attendance at the Round Tables varied from fifty to three hundred. But the membership of each was perfectly homogeneous, so that no one was bored. The joint meeting brought together as they ought to come together the college men and the high school and academy men — and women. It was the first meeting of the kind I ever attended where the principle of reciprocity was completely recognized. The regular programme for such meetings is an exchange of courtesies that often are acrimonious. The time is passed in cataloguing each other's sins, of omission and of commission, and in telling each other they don't know what they are talking about. The result is often fun, but seldom profit. But this joint meeting met for another purpose and in a different spirit.

The officers for next year have a fine example to follow. They must begin early and work hard if they will escape odious comparisons at — Minneapolis, or Milwaukee? C. H. THURBER

IMPORTANT REPORTS FOR SECONDARY EDUCATION

JOINT COMMITTEE ON COLLEGE ENTRANCE REQUIREMENTS OF THE DEPARTMENTS OF SECONDARY AND OF HIGHER EDUCATION OF THE NATIONAL EDUCATIONAL ASSOCIATION. REPORT ON PLAN OF WORK FOR 1896–7

IT IS within the province of the Committee according to the resolution passed at the Denver meeting, to investigate existing college entrance requirements, and to report on ways and means of securing such uniformity in extent and method as will be conducive of the best interests both of higher and of secondary education. The first step — investigation of existing requirements — has been taken; in our opinion the programme of the ensuing year should be chiefly as follows:

1. The Committee should invite the active coöperation of associations already organized for the study of such problems; it should appoint representative sub-committees of specialists interested in the various subjects; it should ascertain the views of individual institutions — secondary schools, colleges, and universities — all with a view to the ultimate determination of what should constitute a normal requirement in each of the subjects set for admission to college.

2. To this end it is recommended that the requirements be considered in the following groups: English, classical languages, modern languages, History, Mathematics and Sciences.

3. Within the several groups special attention should be given to what should constitute a year's work in each subject (*e. g.*, first year French, second year French, Physics, Chemistry, etc.), or, as may be preferable in some groups, what should constitute the "elementary" and what the "advanced" requirements, and, in general, the constitution of entire courses of study in the separate subjects.

4. It is recommended that a schedule of options or equivalents within the various groups, or between separate groups be prepared.

5. The Committee should make special effort to secure a more satisfactory method of admission to college. The views of the associations, sub-committees and institutions (above referred to) should be

sought as to the best pedagogical means of testing the work done in preparation for college.

6. All partial reports should be submitted to the Committee as early as possible that a tentative report may be prepared for discussion at the next annual meeting of the National Education Association.

7. The departments of higher and of secondary education and of science should be requested to make this subject a special order in their programmes for the meetings in 1897.

8. It is evident that the work outlined cannot be done without the expenditure of a considerable sum of money. This Committee should urge upon the departments of higher education, of secondary education, and of science, the necessity of petitioning the Board of Directors of the National Educational Association for an appropriation to be made at as early a day as practicable, sufficient to complete the work.

REPORT OF COMMITTEE OF THE MASSACHUSETTS ASSOCIATION OF CLASSICAL AND HIGH SCHOOL TEACHERS

The Committee appointed by the Massachusetts Association of Classical and High School Teachers at the annual meeting held at Brookline, April 11, 1896, to confer with the examining boards of the New England Colleges respectfully present the following recommendations in behalf of the Principals of the Classical and High Schools of Massachusetts.

The Committee wish to preface these recommendations by the statement that they conceive their special function to be a presentation of the difficulties experienced by the smaller High Schools of the state in meeting the College requirements for admission. These schools have not (it seems to this Committee) been adequately represented in the deliberations and recommendations of the New England Association of Colleges and Preparatory Schools, the valuable results of whose labors, however, this Committee fully appreciates. Comparatively few of the 252 High Schools of Massachusetts are in touch with the Colleges. This is not a desirable condition of things, and any measures that tend to increase local opportunities of preparation for College are worthy of careful consideration.

The recommendations offered herewith tend in the desired direction, as the Committee know from their own experience, and from an extensive correspondence with Principals of High Schools and Acade-

mies ; and though they are not very far reaching the Committee realize that much needed upbuilding of the smaller schools, on the one side, and the needed modifications of College entrance requirements on the other are matters of slow change not to be overhastened with safety.

RECOMMENDATIONS

1. The Committee recommend that the requirements for admission to College with or without Greek be made more nearly equivalent.

The substitutes for Greek, as now allowed by Harvard, require more time in preparation, and are, also, more difficult than the Greek.

To illustrate: To prepare for both the elementary and advanced Greek now requires three years (120 weeks) of four recitations a week, 480 recitations, securing five counts, or points on the whole examination.

The most favorable combination of substitutes is as follows:

A modern language, both elementary and advanced,
3 yrs. (120 wks.) 4 rec. 480 rec. securing 3 points.
Advanced Math., 1 yr. (40 wks.) 4 rec. 160 rec. " 2 "
Advanced Physics
or Chemistry, 1 yr. (40 wks.) 4 rec. 160 rec. " 2 "

In other words, as a substitute for the five points of Greek requiring 480 rec., seven points requiring 780 rec. are required.

The second Mathematical requirement of Advanced Algebra and Analytics is distinctly more difficult than the first of Solid Geometry and Trigonometry. Could this be reduced in difficulty it would be a gain. Could Advanced Latin Composition be counted as an *entire* Advanced Subject, much relief would be afforded, and without detriment to the standard of admission.

The present difficulty of the substitute for Greek forces to the selection of that subject many pupils who take it as an elementary subject, intending, from the start, to drop it after the examination.

The smaller schools, necessarily limited in the number of teachers, find themselves restricted to Greek in most cases, on account of the nature and difficulty of its substitutes. Many have not the facilities for the Science requirements, and the Greek is easier than the double Mathematical requirement or than the combination of the Latin Composition with the Mathematics.

2. While considering that the present requirements of Colleges having the highest standard are not excessive (except as indicated in the

first recommendation) the Committee recommend that no change be made in the present requirements for admission which shall increase the number of required subjects or essentially enlarge the total amount of work. This does not refer to contemplated additions to the Mathematical requirements for admission to some of the Scientific Schools. As a matter of fact, the Committee consider that serious harm is wrought by the low standard of admission to some of the Scientific Schools.

3. *a.* The committee recommend that more than one hour be given for writing the examinations in Algebra and Geometry. This increase in time for the examination does not necessarily involve an increase in the relative rating of these subjects. They could still be estimated as *one* hour subjects.

b. With regard to the annual changes in the books required in English, the Committee, finding themselves unable to speak (as they do in the case of the other recommendations) with the united approval of all whom they represent, have no definite recommendation to make at present.

Recognizing that the work done by the Commission of New England Colleges has properly emphasized the place of English in the list of requirements, and has resulted in a greatly improved method of examination in that subject, the Committee dislike to have this benefit in any way diminished for the smaller High Schools of the state. The annual purchase by the smaller cities and the towns of sets of books which four or five years later are to be laid aside, apparently forever, seems to this Committee an additional burden for which they find no real compensation, and a burden which will be an accumulating one.

They fail to see why a novel of Scott, for instance, which is suitable in 1895 for the purpose of study and examination, is not equally suitable in 1897, and would suggest, therefore, that should the statement of the requirement indicate the author and number of his works to be studied (as two novels of Scott, three plays of Shakespere), leaving it with the school to select the particular work, or works, and should the list of books assigned for careful study remain unaltered for, perhaps, a decade, all the chief advantages of the plan would be retained, and a burden, increasingly serious, would be removed from the smaller communities, so many of which are providing liberally (in proportion to their means) for secondary education.

In the smaller schools where there are but one or two pupils pre-

paring for college, these cannot be handled in a separate class, so that it is not a question merely of one or two copies of each of several books, but a section of from fifteen to thirty must be supplied with sets of the same books. The mere storage of these books will be a difficult matter after a few years. The burden is a real one and this Committee believes that in a few years it will be felt much more positively. So many principals of the *larger* schools do not feel this burden at present that this Committee can only present this view of the case for the careful consideration of all concerned.

c. The Committee recommend that for sight translation in Latin, the applicants be expected to have as a vocabulary all words occurring at least twice in Cæsar's *Gallic War*, Books I–IV; Cicero's *Catiline*, I–IV; *Archias; Manilian Law;* Virgil's *Æneid*, Books I–VI; and that the meaning of other words occurring in the assigned passages be given. A similar recommendation for Greek at sight would suggest Xenophon's *Anabasis*, Books I–IV; Homer's *Iliad*, Books I–III; *Odyssey*, Book I.

For the prose composition requirements, it is recommended that the vocabulary expected of the applicant include only words occurring at least twice (for the Latin) in one book of Cæsar and one oration of Cicero; (for the Greek) in two books of the *Anabasis*; the College to determine and to announce in advance the books and oration.

4. *a.* The Committee recommend that in the case of Colleges at present not accepting certificates in place of entrance examinations, those applicants who present themselves for examination in advanced subjects be credited with the preliminary requirements in the same subjects without examination, on the presentation of a certificate from the principal of the preparatory school that they have completed that requirement, in case the principal so requests.

b. The Committee recommend either that there be given an opportunity for the examination of applicants, two years before entrance, in History, Elementary Latin, and in either Elementary Algebra or Plane Geometry, or that the certificate of the principal be accepted in these subjects without examination, in the case of all schools desiring to offer the certificate.

Most schools are compelled to place these subjects in the first two years of their courses, and find the regular work of the last two years much crowded by the necessity of reviews in them just prior to examination. The present difficulty is similar to that which would be

experienced by college students should they be required within one year from graduation, to pass examinations in the studies of the Freshman and Sophomore years in addition to those of the Junior and Senior years. The pupils of the secondary schools, however, are more immature, and the responsibility of their work rests on the school, while college students are personally responsible. In this respect, therefore, the illustration does not show the full extent of the difficulty, but only its nature.

5. The Committee recommend that where the same subjects are required for admission to the different Colleges, or Scientific schools, there should be uniformity in the amount required and in the nature of the examination: *e. g.*, the Elementary Latin requirement should be the same for all, the Advanced Latin the same for all, the Elementary Algebra should be the same for all, etc.

In conclusion, the Committee express the hope that these recommendations will approve themselves to the careful judgment of the examining boards and will be adopted by them for the purpose of removing some of the present difficulties experienced by the smaller schools in fitting pupils for College.

COMMITTEE:

CHARLES S. MOORE, *Chairman*
E. D. RUSSELL
W. L. EATON
H. W. KITTREDGE
J. O. SANBORN, *Secretary*

REPORT OF THE COMMITTEE OF THE STATE TEACHERS' ASSOCIATION OF MISSOURI[1]

COURSE OF STUDY FOR SECONDARY SCHOOLS

The Committee interpret the term "secondary schools," as used in these recommendations, to include the public high schools, the academies, and schools preparatory to college.

Four parallel courses, as outlined in detail in accompanying schedule, are recommended by the Committee.

[1] This report treats also of Colleges and Universities, but only the part referring to secondary schools is printed here.

PARALLEL COURSES OF STUDY FOR SECONDARY SCHOOLS

	No. 1	No. 2	No. 3	No. 4
	ENGLISH	MODERN LANG. & SCIENCE	LATIN AND SCIENCE	CLASSICAL
1st Year	English Algebra Zoölogy Gr. & Rom. Hist.	English Algebra Zoölogy Gr. & Rom. Hist.	English Algebra Latin Gr. & Rom. Hist.	English Algebra Latin Gr. & Rom. Hist.
2d Year	English Algebra Bot. or Phys. Geog. Eng. Hist. & C. G. or Mod. Hist. or Am. Hist. & C. G.	English Algebra Bot. or Phys. Geog. Eng. Hist. & C. G. or Mod. Hist. or Am. Hist. & C. G.	English Algebra Latin Eng. Hist. & C. G. or Mod. Hist. or Am. Hist. & C. G.	English Algebra Latin Eng. Hist. & C. G. or Mod. Hist. or Am. Hist. & C. G.
3d Year	English Geometry Physics Mod. Hist. or Eng. Hist.&C.G.,Am. Hist. & C. Gov.	English Geometry Physics German or French	English Geometry Physics Latin	English Geometry Latin Greek
4th Year	English Chemistry Solid Geo. & Trig. Reviews or option- al study	English Chemistry German or French Reviews or option- al study	English Chemistry Latin Reviews or option- al study	English Physics Latin Greek

For schools unable, on account of lack of teaching force, to undertake all the work outlined above, the following recommendations are made:

1. The school having but one teacher should confine its work to the *first* and *second* years of course No. 1.

2. Schools having not more than two teachers should confine themselves to the first *three* years of course No. 1.

3. Schools having only three teachers should confine themselves to full course No. 1, or to the *first three* years of course No. 1 and No. 3.

4. Schools having only four teachers should not undertake more than *two* of the four full courses.

5. Schools having five or more teachers may be able to do the full work of the four parallel courses as outlined above.

REMARKS

1. In the interest of uniformity the Roman method of pronouncing Latin, with strict attention to quantity, is strongly urged. The Greek

language should be pronounced in accord with the written accent and the quantity of the vowels, as laid down by the Greek conference of the Committee of Ten.

2. A library should be used as a laboratory for work in history, literature, and language as well as for general reading. The larger schools should provide suitable rooms and should employ a competent librarian whose whole time is devoted to helping pupils in their reading and investigation. Collateral reading in such a library should be part of the regular work, especially in history and in literature.

3. Map drawing is valuable in emphasizing the geography of the countries studied in history.

4. Work in laboratories should be done under the general supervision of the instructor, but should be done *by the student*. Laboratory notebooks should represent, in historical order, every step in his own experiments and observations, so as to be a fair index of the real work done by the student.

5. In the interest of thorough work in secondary schools, it is strongly recommended that no teacher be assigned more than seven working periods per day, with a maximum of thirty pupils in a section.

The Committee recommend that the President of this Association appoint, with power to act, a committee of seven, representing the different educational interests of the state, to take steps toward securing legislation establishing an Educational Commission with power to make effective the purposes of this report.

COMMITTEE:

R. H. JESSE
W. H. BLACK
W. S. CHAPLIN
GEO. L. OSBORNE
A. F. FLEET
W. T. CARRINGTON
L. J. HALL
JOHN R. KIRK
J. D. WILSON

BOOK REVIEWS

An English Garner. Arber's English Reprints.

THE Macmillan Co., having recently become the American agents for Professor Arber's works, published in England by Archibald Constable & Co., this remarkable series is now brought to the attention of students and scholars in this country. (For a list of the series see SCHOOL REVIEW, January, 1896). The *English Garner* is so far out of the way of the usual anthology that one might easily, from the name, be quite mistaken in the content. The sub-title "Ingatherings from our History and Literature" is quite inadequately descriptive. This is not a choice selection of favorite extracts from poets and historians whose complete works are in print, but perhaps too costly for us to buy, it is rather a great storehouse of original material for the study of history and literature. The *Garner* is made up of complete reprints of poems and prose extracts from the earlier years of English literature, all of which are out of print, and very many of which can be found nowhere else, the reprints being made from exceedingly rare copies. It comprises six substantial volumes, entirely of material of this kind. All mechanical excellencies of printing have been nicely regarded.

The value of such a collection to the serious student of literature cannot easily be exaggerated. Nor is its value much less to the student of history. It is the fashion, and a good fashion it is, to teach both these subjects now, so far as possible, by constant reference to the sources. Here are sources innumerable, easily accessible, and of the most interesting and valuable kind. To advanced students the work must be indispensable, while to the beginner in literature it will afford endless stimulus and interest. The series of reprints carries out more completely the idea underlying the *Garner*. In the reprints more extended works are put each in a separate volume, with the antique forms and spelling carefully preserved. Not all authors in those days were good spellers, a fact which our teachers will probably not think well to emphasize. The reprints are quite inexpensive, and could very well be introduced in the class room.

With this collection at hand a much more attractive and scientific study of literature than now prevails might easily be introduced into the schools. One set in the school library would be quite sufficient for a school of moderate size. The period could be studied with constant references from the teacher to these sources, which the students would find delight in verifying. The possibilities of such work have not been realized, in the study of English literature at least, for the lack of material. Now with such a rare collection so easily available it hardly admits of doubt that many teachers will be eager to try a method that is so full of promise, and so thoroughly in accord with the best practice in other fields. At least it will be well worth the while of every teacher of literature to send for a descriptive catalogue of Professor Arber's works, and to consider seriously whether they cannot and ought not to be used in the way indicated. C. H. THURBER

The Elements of Chemistry. By PAUL C. FREER. Boston: Allyn & Bacon.

THE following is from the author's preface: "The methods of teaching beginners now very generally in use do not make prominent what is *essential* in the science. I have endeavored to familiarize the pupil with the general aspects of chemical changes, using only a few of the most important elements and compounds for the purposes of illustration; the work is *quantitative*, both in the text and in the laboratory appendix. . . . . The atomic theory is not introduced until the pupil has sufficient chemical experience to comprehend its meaning and advantages, and until he thoroughly understands that *theories are based on facts*, not facts on theories. The theory of valence I have only briefly touched upon, as it is not necessary for an understanding of Elementary Chemistry. . . . . Chemical equations I have avoided as much as possible, because I wished to give them only the relative importance which belongs to them. The too frequent use of these equations may lead to the view that all reactions that can be formulated must in reality take place. . . . . The domain of so-called Physical Chemistry can no longer be ignored in work of this kind. For this reason I have introduced some of the simple general facts . . . . notably under the head of electrolysis and double decomposition."

Thus far the author. His performance fully and intelligently carries out his purpose. This plainly was to teach the *laws* of chemistry,

not chemical facts about elements and compounds. This he has succeeded in doing with surprisingly small amount of material. I find that he discusses only H, O, N, Cl, S, C, Na, K; he mentions and uses a few times Zn, Ca, Mg, Fe. Of compounds there are probably not much above thirty discussed in the text, and then not for the purpose of studying their general properties, but only for their bearing on the principle in hand. Only the last chapter opens a glimpse into a larger field by the brief characterization of a number of (mainly non-metallic) elements which form series with those already discussed.

The book is modern in the best sense. The changes of energy during the formation, or the breaking up, of compounds, are discussed, though only briefly. Chapters XVI and XVII present briefly the kinetic theory of gases and the relations between the atomic weight and specific gravity. The interesting relations between the specific heat of gases and their other properties are not touched upon. . . . . There is an interesting chapter on substitutions (XXII). The Physics of Chemistry is introduced to a larger extent than in most books for beginners. The number of purely physical experiments is about ten; prominent are, of course, Boyles' law and Charles' law. Chapter XXIII also enters, though not very far, into the recondite physical constitution of chemical compounds, under the head of Electrolysis and Double Decomposition.

This exposé shows the limits set by the author. Within these limits the book must be declared highly successful. The presentation is simple, free from technical verbiage, and admirably clear and forcible. While every essential principle is treated, conclusions are not pushed beyond the facts. In the allotment of the space to the different principles, also, the book preserves a healthy symmetry.

Each of its twenty-four chapters bears a descriptive heading. These chapters contain the dogmatic part of the book. The experiments themselves are placed in the appendix. There are nominally eighty-one of them, in reality about twice as many, as many of them embrace several distinct parts. Numbers referring to them are placed in the text at the proper points. This device relieves the text of the many breaks that distract the reader's attention when the directions for the experiments are placed in the text. At the end of each subject, whether contained in one chapter (as usual) or several, is placed a concise summary, divided into numbered paragraphs; an excellent feature for class and review work.

The typographical execution is excellent. The book is of handy size, the paper good, devoid of gloss, the type good-sized, open, and clear. The heavy-type descriptive headings over the sections of each chapter, the pleasing spacing, the use of small type for notes and special discussions, all help to give the book a degree of perspicuity of arrangement that could not easily be surpassed. Altogether this must be pronounced one of the most useful as well as one of the handsomest of the text-books recently published.

And yet I should not call it an easy book. I should not like to use it with a class that had not studied Physics before. Perhaps no presentation could have made the subject easy, except one that would have cut out just what the author considers essentials. As a matter of fact many of the generalizations of Chemistry are much harder to grasp for a youthful mind than most of those of Physics. That this view is shared in some very competent places would appear from the relative positions assigned to Physics and Chemistry, for instance, in the Harvard College requirements.

And now, one question of larger bearing. As said above, this book is an admirable representative of the direction science teaching has taken within the last dozen years. Are we moving in the right direction altogether? If I read the principle aright, which the recent books emphasize more and more, it is the use of scientific facts mainly as a means of mental training *by the discovery of the general principles and laws from selected facts and experiments.* Our Beginners' Chemistries aim above all at teaching the chemical *laws*, abstracted from as few elements and compounds as possible; our Botany is Plant Physiology almost altogether, our Zoölogy is Biology. Many of our latter-day text-books are written by university men who write from first-hand knowledge of the subject, which is an inestimable gain. Does the direction in which we are moving also exhibit due regard for the mental characteristics of the age of the students that are to use the books? Are we inclined to demand abstractions of an age that has never yet faced any scientific facts whatever, and is as yet fit for the concrete only? Does our total neglect of systematic and determinative botany breed a race of botany students to whom a walk in the fields is uninteresting, because they do not know a dozen of the plants and flowers they see? Does our chemistry teaching upon philosophical lines breed a race of young chemists who know the law of Avogadro, but think brass an element, and who do not know tin from zinc,

because their instruction did not carry them beyond the non-metallic bodies?

I should not dare to answer any of these questions, but I am old-fashioned enough to recall with delight my first chemistry instruction, which was upon the lines of old Stöckhart, and which made me set up in my room, unbeknown to my teachers, a laboratory, equipped with my weekly allowance money, where I formed a vast number of the compounds as they came up in class, a method which, though it resulted in holes in the carpet, also resulted, through compositions, decompositions, meltings, heatings, precipitations, filtrations, and distillations in a detailed and intimate knowledge of most of the leading elements and their principal compounds that has been of inestimable value to me ever since. My chemical philosophy I learned, most of it, in a subsequent course, at the Polytechnic School.

J. J. SCHOBINGER

HARVARD SCHOOL, CHICAGO

Milton's Prosody. By ROBERT BRIDGES. Oxford: The Clarendon Press.

MR. ROBERT BRIDGES brought to his investigation of Milton's blank verse the ear of a poet. His little book affords a solution of many questions which vex the soul of the teacher whose class must scan Paradise Lost today, Samson Agonistes tomorrow. The former poem is hybrid in its metrical theory, but the ruling tradition is the quantitative. In the latter poem Mr. Bridges finds that Milton came to determine his rhythm by stress, "though he learnedly disguised his liberty by various devices." The question cannot be discussed here. It is evident that Mr. Bridges sides with those scholars who insist on a prosody of stress for English poetry. He does not deny that in English two short syllables may sometimes be equivalent to one long one; but it seems to him "wrong to imagine that English rhythms can ever be explained or governed by such a fiction as this, when it is made a general law." Milton's rules of elision will be a welcome subject to teachers. In Paradise Lost open vowels were considered by Milton as theoretically elides: "that is he intended that they should not count in the scansion; yet though he printed *Th' Almighty*, etc., it cannot be supposed that he wished it to be so pronounced." This makes a good working rule of pronunciation; but there is danger that the theory involved

may be made to account for too much. Mr. Bridges has nothing to say concerning one striking characteristic of Milton's blank verse: that it is to be read and understood in the long sweep of whole sections. These blank-verse stanzas of Milton have been made the subject of minute examination by Professor Corson.

E. H. LEWIS

LEWIS INSTITUTE

Elements of Botany, by J. Y. BERGEN, A.M., Instructor in biology, English High School, Boston. Ginn & Co., 1896. 275 + lvii pages. $1.20.

THIS book is an expansion of the laboratory notes which have formed the basis of the author's instruction in the English High School, Boston, and as might be expected by those who know of Mr. Bergen's work in the Harvard Summer School, it is thorough, comprehensive, and very suggestive. It is intended as a text-book for class-room instruction; it is a laboratory manual and in Part II contains an analytical key and description of the commonest spring flowers found in the northern and eastern states. This part includes a description of 31 families, 77 genera, and 153 species. It might be criticised for omitting some species very common in this vicinity, *e. g.*, the wild hyacinth (Camassia Fraseri) and Phlox Pilosa and some species very common East and West, such as Yellow-eyed grass (Hypoxis Erecta), Spiderwort (Tradescantia Virginica) and Spice Bush (Lindera Benzoin) but probably no two botanists would agree upon the same list of 150 flowers commonest East and West. The pupil has, moreover, or should have, access always to *Gray's Manual* or *Wood's Class Book* if this smaller manual fails him. It is undoubtedly true that the old method of analysis and identification of a large number of species has been overdone, and that the better method is that of comparative study of the more important families as indicated by Spalding. Yet Mr. Bergen's book contains enough material to give the student the method of floral analysis which every student of botany should understand.

This book contains more distinct features than any elementary text book with which I am acquainted. Running through it without attempt at sharp divisions are directions for laboratory work of a morphological and physiological sort as well as directions for the study of gross and minute anatomy. This latter feature calls for the use of the

compound microscope in the hands of each student or each small group. The physiological experiments are 33 in number.

The author follows the plan of *Gray's Elements* both in dwelling very largely on phanerogamous plants and in his order of presentation of topics. He follows the cycle of development from seed and root through stem, bud, leaf, flower, and fruit back to seed again. The physiology and morphology of these organs are carefully presented. The minute anatomy and in fact the whole subject is illustrated by many diagrams and pictures.

The subject of fertilization and of the dependence of plants upon wind and animals is illustrated at much greater length than is usual in elementary books. The chapter on "The Struggle for Existence" is one of the most interesting in the book. It includes among other topics the following: weeds, their origin; the dispersal of seeds; destruction of plants by unfavorable climates, by other plants, by animals; adaptations to meet adverse conditions; how plants protect themselves. The study of a few types of "flowerless" plants is given after the study of the higher forms has been completed. These include protococcus, the yeast plant, black mould, pigeon weed, moss, and a fern.

Four useful appendices are given: (*a*) on the use of the compound microscope; (*b*) apparatus and reagents; (*c*) material for study; (*d*) list of reference books. "East of the hundredth *parallel*" on page v means, of course, east of the hundredth meridian.

R. H. CORNISH

THE MORGAN PARK ACADEMY
THE UNIVERSITY OF CHICAGO

Introduction to the Study of Latin Inscriptions. By JAMES C. EGBERT, JR., Ph.D., Adj. Professor of Latin, Columbia College. Pages 468. Price $3.50. American Book Company.

THE cause of classical scholarship in America has been distinctly aided by the publication of Professor Egbert's excellent work on Latin Inscriptions. The book is a marked advance upon anything attempted hitherto on this subject in English. Its appearance at this time may well be taken as a practical illustration of the substantial progress that Latin studies have made in this country during the last decade. Whatever may be the outcome of the present transition period in educational

affairs and whatever principle may prevail in the new college curriculum, it is gratifying to note that our classical teachers are so generally alive to the demands of the age, and while employing correct scientific methods in their work are at the same time producing some of the most attractive and serviceable helps that have ever been placed in the hands of students. German scholarship and American practicality have been combined with the most happy results.

Professor Egbert recognizes in his introduction the needs of beginners in the study of Latin Epigraphy, and gives with appropriate comment the works to be used and the method to be followed. He includes in his convenient bibliography the most valuable books and collections, a list of the leading periodicals dealing with the new matter which is constantly coming to light, and a good outline description of the *Corpus*, the great storehouse from which the materials for the smaller collections and handbooks are taken.

The body of the work is divided into three parts, each of these comprising three chapters. In the first the Latin alphabet and Roman numerals are discussed. The former is treated in reference both to history and morphology, and its development is well illustrated by numerous plates and tables. Part II is devoted to the Roman name, the imperial titles, and the *cursus honorum*. It also contains a chronological list of the Roman emperors and a large number of inscriptions for practice. The latter are chosen with special reference to the general principles and explanations set forth and illustrated in the text. In a similar way Part III deals with *Tituli* and Documents. Under the former, dedicatory, sepulchral, and honorary inscriptions are described; likewise inscriptions on public works and on movable objects, including weights and measures, armor, water pipes, jewelry, mine products, tiles, bricks, and vessels of clay. Under the head of Documents, laws and decrees, private, public, military, and sacred documents, and wall inscriptions are discussed and interpreted. The final chapter gives an interesting and exceedingly practical account of the restoration and dating of inscriptions, and in addition to this contains lists of archaisms, of the Roman legions, members of the imperial family, and the various abbreviations found in epigraphical remains. An index and table of inscriptions complete the whole and add to the value and convenience of the book.

The work contains in all nearly 700 inscriptions. These, with the exception of inscriptions taken from movable objects, are printed in

ordinary type without any attempt to imitate the original letters. The book is rendered very attractive in appearance, and its value for purposes of instruction is greatly increased by a large number of photographic reproductions from the facsimiles of Ritschl's *Monumenta Epigraphica* and Hübner's *Exempla*. The most interesting among these illustrations are the famous Duenos inscription, the *fibula Prænestina*, the *decretum* of L. Æmilius Paulus, 189 B.C., the *Monologium Rusticum Colotianum*, various *leges*, and the *tabulæ* of a Dacian triptych.

In the preparation of this volume the author has necessarily profited very much by the labors of others, to all of whom he makes due acknowledgment, especially to Cagnat, Hübner, and Dessau. He has, however, shown genuine enthusiasm in dealing with his subject, and has given abundant proof of a thorough mastery of details, which alone could make possible the successful completion of his task.

The immediate value of this treatise lies in the fact that it will give to English-speaking students a ready introduction in their own language to a most interesting and important department of Latin study. The books of Allen and Wordsworth have rendered good service in their day, but the present condition of classical teaching demands a more complete and attractive work than either of those pioneer volumes of twenty years ago. With this manual completely mastered, the student will be prepared to pursue his investigations and researches in the almost limitless materials that will lie open to him and invite his attention.

It would not be an easy matter to improve upon Professor Egbert's work, and yet we would suggest that fuller explanatory notes on some of the most difficult inscriptions would be of special value to the beginner, as the reference books to which he must otherwise look for aid are not always easily accessible or convenient to use. Then again the immense importance of inscriptions as sources of historical information might have been made more prominent. A special chapter duly emphasizing this point, followed by a full discussion of a few inscriptions carefully chosen for the purpose of illustrating this particular feature, would be of the highest service. The chief excellence of Rushforth's brief treatise lies in the emphasis he places upon the historical side of epigraphical studies and in his well-directed effort to aid the learner in gaining a due appreciation of "the value of inscriptions as historical evidence."

It may not be out of place here to call attention to the paper on

"Latin Inscriptions and Latin Literature" read by Professor Warren of Johns Hopkins University before the American Philological Association at its annual meeting in 1895, and published in full in the Transactions. This furnishes an excellent introduction to Professor Egbert's book, and shows the pupil in how many ways inscriptions have contributed to our knowledge of language, history, law, and literature.

The publishers deserve hearty commendation for the excellent taste and marked liberality they have shown in the mechanical makeup of the volume.

FRANK E. ROCKWOOD

BUCKNELL UNIVERSITY

The Education of the Greek People and its Influence on Civilization, By THOMAS DAVIDSON. D. Appleton & Company's International Educational Series.

IN the first chapter the author outlines his own conception of education and also gives his ideal educational programme. This chapter might well stand as an independent essay of great interest and value. Its purpose here is to present an ideal with which Greek education may be compared.

From the second chapter I cannot forbear, even at the risk of the editor's scissors, from quoting the following: "To the cultivated Greek, life divided itself sharply into two portions, one to be devoted to means and the other to ends. Under means was included whatever related to practical life—the earning of a livelihood, politics, war, education, religious observances, etc.; under ends what were called the occupations of the muses—that is, fine art, science and philosophy. These, indeed, were the ends to which all other occupations were but means. The enjoyment of them was designated by the term *diagōgē* (a course of life), which must be clearly distinguished, not only from practical life, but also from mere play or amusement. Play was regarded as a mere preparation for practical work, therefore as a means to a means; diagōgē, on the contrary, was the end and aim of practical work. This distinction conditioned the whole of Greek life and education."

If teachers and educational theorists were to clearly distinguish the ends of life and their means in the light of Mr. Davidson's book, the coming of the educational millennium would be much hastened thereby.

In his conclusion the author presents the following excellent summary of the merits and defects of Greek education :

"Greek education did at every period of its career seek with all the means in its power, by a graded process of rational discipline, to lift men out of the bonds of animal necessity into moral freedom as the Greeks conceived it. It was at all times marked by unity, comprehensiveness, and aimfulness. It left no part of man's nature, known as such, uncared for. And so successful was it, so much did it transmute and elevate human nature, that to the Greeks is justly accorded the honor of having discovered the principle of human freedom, and of having placed the sword of victory in the hands of reason. They not only lifted the world out of barbarism, but it requires their influence even to this day to prevent it from falling back into the same. Even Christianity itself has sunk into barbarism and superstition wherever it has withdrawn itself from Greek influence. So much for the merits of Greek education. Its defects are all summed up in one. By substituting philosophy for religion, by cultivating unduly the abstract reason, which is the organ of the former, and ignoring the supernatural sense, which is the condition of the latter ; by placing the supreme activity of man in intellectual vision instead of in moral life guided by vision, love, and a good will, it failed to put itself in living relation to the supreme principle of that moral freedom which is the 'chief end of man.' In consequence Greece not only perished herself, but she left an example by following which other nations have perished — yea, and other nations will yet perish, unless, warned by her fate, they make all education culminate in the culture of the spiritual sense which reveals God, and so place religion on the throne that belongs to her as the guide and inspiration of life. Thus as Christianity without Hellenism sinks into barbarism, so Hellenism without Christianity leads to destruction. Only when united, as humanity and divinity, do they lead to life and freedom."

The author says in his preface: "This work is not intended for scholars or specialists, but for that large body of teachers throughout the country who are trying to do their duty but are suffering from that want of enthusiasm which necessarily comes from being unable clearly to see the end and purpose of their labors, or to invest any end with sublime import. I have sought to show them that the end of their work is the redemption of humanity, an essential part of that process by which it is being gradually elevated to moral freedom, and

to suggest to them the direction in which they ought to turn their chief efforts. If I can make even a few of them feel the consecration that comes from single-minded devotion to a great end I shall hold that this book has accomplished its purpose."

The writer has not failed to perform his part towards the accomplishment of this noble purpose, and the attentive reader can scarcely fail to be moved towards higher educational ideals. The subject of the book and its title may lead many who need it most to think it is not for them. It might well be entitled, A book to be read, inwardly digested, and assimilated by everyone connected with schools, including school officers and teachers, from kindergartens to universities; and by everyone else who desires to obtain a larger, clearer, and truer view of life, with its duties and privileges.

The clearness of the writer's thinking and the directness and simplicity of his expression cannot fail to make the book interesting and valuable to all its readers, even to those of limited education.

WM. M. ABER

UNIVERSITY OF MONTANA

Studies in Education — Science, Art, History. By B. A. HINSDALE, PH.D., LL.D. Werner School Book Company, Chicago, 1896. Pages 384.

THE leading educational men of today are numerous and by no means inactive — notice the list of authors and the range of topics in the International Education Series published by the Appletons: — Baldwin, Pickard, Parker, Hinsdale, Klemm, Howland, Boone, Martin, McLellan, Dewey, and the rest. The multiplication of books of value to the educator, within comparatively a few years upon educationa, themes only shows how the best minds in America have concentrated their attention upon these subjects. The contributions of Dr. E. E. White, Dr. W. H. Payne and Dr. B. A. Hinsdale to educational thought may, without flattery and without disparagement of other writers, be cited as belonging in the very front rank.

In the work before us Dr. Hinsdale again places us all as his debtors. The book is a collection of twenty valuable papers upon such vital topics as the following: "Sources of Human Cultivation," "The Science and the Art of Teaching," "President Eliot on Popular Education," "The Moral and Religious Training of Children," "Payment by

Results," "The American School Superintendent," "The Educational Function of the Modern State," and reviews of education in various countries.

These essays, as a whole, form a valuable addition to our study of several educational problems of vital interest today. In his criticism of President Eliot's arrangement of what the latter calls the "Calvinistic Theory" of education, is some very close and important reasoning; particularly the author's well-drawn distinction between work and play and the necessity of both of them.

In the able paper on "Moral and Religious Training of Children," the author says: "The intellectual apparatus which directly affects the spiritual life is simple. No doubt many facts and ideas affect it indirectly, and in the long run; but the religious lessons that need to be taught to children, and especially to young children, are few in number. The wisdom, purity, and goodness of God, the love of Jesus, the capacity of men for growth and happiness, and the duty to seek those ends; wisdom, purity, forbearance, justice, magnanimity, truth, and goodness; men reap what they sow;— these ideas lie at the basis of the moral life. The great care of the parent or the teacher should be to commit the child to virtue and piety, and to leave theology to the future man or woman." The entire essay is one of great value to the conscientious teacher.

In the article on the superintendency is found a discussion of an important question which ought to interest all thoughtful educators. Upon this matter legislation is far behind the age. We have not yet outgrown the earlier times when the "committee-man" had the full charge of the schools.

Massachusetts has been the leader in many forward movements in the educational field, and she is in advance of all other states today in the matter of local supervision, but even in the Old Bay State, while there are *forty pages* of laws relating to the supervisory powers of school-committees, there is not one to designate the powers and duties of the city or district superintendent.

The book is full of solid thought for all teachers and superintendents. It is to be commended for its strength, logic, and directness.

WILLLIAM A. MOWRY

HYDE PARK, MASS.

NOTES

PROFESSOR R. W. MOORE contributes to the June *Academischen Revue*. Munich, a handsomely illustrated article on Colgate University.

THE Seventh Educational Conference of the high schools and academies affiliating or coöperating with The University of Chicago was held at The University of Chicago Saturday, June 6, 1896.

THE *Graduate Courses for 1896–7*, giving the courses offered by twenty-three of the leading colleges and universities in this country, has been issued from the press of Leach, Shewell & Sanborn.

L'ÉTUDIANT is the name of a new monthly review devoted to the study of the French language and literature. It is edited by Alfred Hennequin, and published by the Germania Publishing Company, Boston, Mass. It is modeled after *Germania*, which is favorably known to students of German.

WE TAKE pleasure in calling attention to Professor Frank Thilly's admirable translation of Weber's *History of Philosophy* (Scribner's), first because the translation is as nearly perfect as any translation can be, and secondly because the work is so admirably fitted for acquainting the student with the history of the development of thought.

IN the first quarterly number for the present year, *Current History* gives renewed cause for the emphatic commendation which this useful publication has merited and retained since its inception six years ago. There is no question of the day of general interest which is not here fully and intelligently presented in all its essential features.

THE home circulation of books from the Chicago Public Library is, according to the recently issued annual report, 1,173,586 volumes. This breaks the world's record for free circulating libraries. This result is due to the delivery stations that have been established in all parts of the city, which bring the library practically to the doors of all the people.

IT HAS for some time been recognized that the province of Ontario had an exceptionally valuable man to serve it as Minister of Education, as well as a school system of great efficiency. This minister, the Hon. George W. Ross, has described the system in *The School System of Ontario*, in the International Educational Series (Appleton), making a volume that has great value for the student of comparative systems of education.

THE attendance of women at the University of Berlin has decreased from sixty in the winter semester to thirty-five in the summer semester. This is not so strange in view of the fact that a woman seeking admission must secure permission (1) from the Minister of Education, (2) from the Rector (president) of the university, (3) from the teacher with whom she wishes to study. The process must be repeated every half year. There are other difficulties, too.

D. C. HEATH & CO. have recently published a chart showing *The Descent of English Sovereigns*, which sets forth with admirable clearness the relations between the various royal houses of Great Britain; and also Shakespeare's *Henry V*, in *The Arden Series*. The merits of this series are so conspicuous that we are not at all surprised to learn that the earlier volumes have received the cordial commendation of nearly every prominent teacher of English in this country.

THERE is nothing that possesses greater interest than the biography of a great man. The *Memoirs of F. A. P. Barnard, Tenth President of Columbia College*, by John Fulton, recently published by The Macmillan Co., is much more than a worthy memorial of a distinguished scholar; it is an invaluable contribution to the history of higher education in the United States. Dr. Barnard's service as college president covered the memorable transition period when university ideas and methods gained a real place in this country. His own attitude in this struggle is portrayed, largely in his own words, in the present volume.

"I WOULD remove all unnecessary friction and try to make study as natural as play." This sentence, from the preface to *School Recreations and Amusements*, by C. W. Mann (American Book Co.), may fairly be taken as the keynote of the book. The rehabilitation of play as a means of education is a feature of recent pedagogical literature of the greatest significance We are returning to Athenian standards. The tendency is a good one, big with hope for happy childhood and useful manhood and womanhood. This book will be a most convenient and suggestive manual for teachers who are anxious to make the most and the best of the play instinct in their pupils.

GINN & CO.'S new educational books are: *The Strong and Weak Inflection in Greek*, by B. F. Harding, A.M., head master of the Belmont School, Belmont, Mass.; *Preparatory Latin Composition*, by F. P. Moulton, A.M., teacher of Latin in the Hartford High School, with revision and editorial assistance by William C. Collar, A.M., head master Roxbury Latin School; *Glaciers of North America*, by Israel C. Russell, professor of geology in the University of Michigan; *Via Latina*, a new Latin reader, by William C. Collar, head master of Roxbury Latin School; *Experimental Physics*, by William Abbott Stone, A.B., instructor in physics in the Phillips Exeter

Academy; *A Practical Arithmetic*, by George A. Wentworth, author of the Wentworth series of mathematics.

NEVER were there so many books written on education as now. This means, at least, that there are more people interested in writing such books, and probably that there are more who will read them. Among these books are some that are worthless, more that are pretty good, and a few that are good. The latter may be divided into two kinds, those that are original in content, and those that restate what has long been the property of the race in a new form and for a new audience. It would seem as though Professor H. Holman's *Education* (Dodd, Mead & Co.) were of the latter class. It is a rather sumptuous book, written pleasantly, lacking, however, in close analysis and using terminology which, in this country, has become largely obsolete. Today we have very little to learn from England as to either the theory or the practice of education. The centers of educational leadership are now in the United States and Germany, and each is supreme in certain fields. Professor Holman's book will doubtless be invaluable in Great Britain, but there are plenty of better books available for American teachers.

FEW have any idea that there are such works as educational classics, and fewer still have ever seen any. Original copies were out of print generations ago and are very difficult to obtain. Only recently has there been any movement towards bringing these classics within the reach of modern readers. This has been attempted in two ways—by exact reproduction so nearly as might be, and, in the case of those written in a foreign tongue, by translation. *The Great Didactic of John Amos Comenius* has been translated latest of all, and furnished with a biographical and historical introduction by M. W. Keatinge (Macmillan). The work appears in England, where, indeed, all these reproductions have originated. *The Great Didactic* is the work of one whose real greatness is becoming more apparent as generations pass. Most of the new things that are good in the modern art of education may be traced back to Comenius. The book is, then, not of mere historic or curious interest, but can be read with practical profit. The fact that Comenius might have been president of Harvard College, brings him a little nearer to us.

THE subject of Child Study is one in which this country is now leading the world, thanks to the zeal and knowledge of G. Stanley Hall. Many foolish things are no doubt done in its name, but not by the real workers in this field, who make mistakes, it is true, but usually find them out much more quickly than their lay critics. For several years a method of child study has been pursued at the Worcester, Mass., Normal School which has, indeed, been described once or twice in magazine articles by Principal E. H. Russell, but of which, after all, few people had any definite notion. In *Child Observations*, edited by Miss Ellen M. Haskell (Heath), some of the results of this method

are first published. The present volume is the first of a series, and is limited to observations on imitation and allied activities. The introduction by Principal Russell ought to be read by everyone having even the slightest interest in child life. The book itself is a collection of a large number of detached observations of imitative acts of children, which are, many of them, amusing enough in themselves, and which illustrate a large field of child activity.

ROME is a name that always catches the eye and the ear. Whatever the Romans did has a perennial interest for civilization. Yet we know comparatively little of Roman education, and infinitely less has been written about it than about the education of Greece. This may be because it has been generally assumed that Roman education has comparatively little value for the present time. But whatever made the Romans what they were must be of the greatest value to us. In many ways we are like them, more like them than like any other historic people. *The Education of Children at Rome*, by George Clarke, Ph.D. (Macmillan), is a real and valuable contribution to our knowledge of the subject of which it treats. The book is small and costs but seventy-five cents, and is therefore within the reach of many who will not see larger works, such as Professor Laurie's *Pre-Christian Education*. The writer has consulted nearly all the best sources, and his work is careful, judicious, and comprehensive, answering very completely the questions about which most people wish information. It is interesting to note that the work was prepared as a thesis for the degree of Ph.D. in the University of Colorado, an institution that deserves much credit for maintaining high standards in face of strong temptations in the opposite direction.

Medical Examinations. In 1888 the United States was almost the only civilized country in the world which did not as a rule protect its citizens from the imposition of quacks. At that time only five states in the Union exacted an examination for license to practice medicine, and the laws of these states were crude and imperfect and for the most part inoperative.

A licensing examination is now required in 22 states. In fact, if we count Texas, whose laws conflict, the roll includes 23. In all of these states candidates for examination must be graduates of medical schools; in three of these states they must have studied medicine four years; in two states they must have attended at least three courses of medical lectures, though a diploma is not required. One of these two states, Minnesota, will require four courses of lectures but not a diploma after January 1, 1899. In six states applicants must have a competent preliminary education, though the provision is indefinite except in the New York law.

The laws in 13 states and three territories demand either approval of medical diploma or examination by state or other duly qualified boards.

This leaves only New Hampshire, in which not even registration is required, and eight states and three territories in which it is necessary merely

to present the diploma or other certificate of qualification to unqualified local officers. The advance in the whole country since 1888 is without parallel.

THE Executive Committee of the Association of Colleges and Preparatory Schools of the Middle States and Maryland has arranged for a national conference on the group of important questions clustering about the following general topic: College Entrance Requirements. Some of the divisions of the subject are:

(*a*) The advanced *age* at which the average student now enters college.

(*b*) The advanced age at which college men must now enter the professions, and the effect upon the individual and the community.

(*c*) The tendency of men to omit the college course as college entrance requirements are increased, that they may enter professional or technological schools direct from the secondary schools.

(*d*) Should the present standard of college entrance requirements be lowered through concerted action, and partial, even if not complete, uniformity of requirements?

(*e*) A partial reorganization of our public school system with a view to its more perfect articulation with our colleges.

Are American youth now obliged to "mark time" for a number of years in elementary and secondary education?

(*f*) Effects of lowering the age of entrance to college upon undergraduate and graduate study, and upon the social life of the student.

The form decided upon for the consideration of these topics is that of round-table discussion and debate in the presence of an audience. Stenographic reports will be published in the local and associated press, and in the Proceedings of the Association. One division of the subject will be considered on the Friday afternoon following Thanksgiving, and the other on Saturday morning.

This discussion is to form the main part of the programme for the annual convention of the association, which will be held at the University of Pennsylvania on the Friday and Saturday following next Thanksgiving day. The intention is to have a number of the most prominent educators take part in the discussion.

CURRENT EDUCATIONAL LITERATURE

JEAN PAUL FREDERICK RICHTER. By JOSEPH FOSTER. *The Chautauquan*, August 1896.

THE PAST AND THE FUTURE OF PHYSICAL EDUCATION. By A. MOSSO. *The Chautauquan*, August 1896.

THE AIM OF MODERN EDUCATION. By C. HANFORD HENDERSON. *Popular Science Monthly*, August 1896.

COÖRDINATION OF OUR EDUCATIONAL INSTITUTIONS. By E. H. MAGILL. *Popular Science Monthly*, June 1896.

CONFESSIONS OF PUBLIC SCHOOL TEACHERS. *Atlantic Monthly*, July 1896.

SIX letters from successful teachers and superintendents in the West and South, wherein the writers frankly tell their own experiences. They are not persons who have grievances. They have few complaints to make. But the straightforward explanation of the conditions under which they work throws a new and startling light on the whole system of our overcrowded and oversystematized schools. In fact there is no other point of view so instructive as this. These confessions emphasize several large facts and tendencies, among them these:

All of the writers confess that their own training was inadequate, and they complain that the teachers who now enter the profession have been inadequately trained.

Nearly every one of them tells of grave hindrances to educational progress caused by the system of the political management of schools. Till teachers and superintendents are chosen without any reference to politics no great progress toward better work can be made.

Every one reveals the fact that the patrons of the schools and the public in general take too little interest in the schools.

BARNARD AND MCCOSH, AND PRESENT COLLEGE PROBLEMS. By D. C. GILMAN. *Atlantic Monthly*, August 1896.

PECUNIARY resources have increased enormously, and this has made possible better buildings, larger libraries, more teachers. Private gifts, land grants, and legislative appropriations have all contributed to this result. With more liberal expenditures there has been greater freedom in every detail. The rigidity of discipline has been relaxed, manners are not so stiff, there is far less of petty regulation, the preaching is not as severe, the methods of living are much more civilizing. "The curriculum" has gone. Either absolute election or a very large amount of choice is now permitted. With the abandonment of one fixed course the required amount of Greek and Latin has been greatly diminished, and it is demonstrated that classical studies have gained more than they have lost by this change. History, English, French, and German receive an amount of attention that was not given to these subjects thirty years ago. On the other hand, there is less attention to public speaking. Of great importance is the wide introduction of laboratory methods in the study of science, especially in physics, chem-

istry, physiology, botany, and geology. Athletics have made marvelous advances. Finally, the admission of women to the advantage of higher education, either by coeducation, or by "annexes," or by separate foundations, is one of the greatest gains of the period under review.

DR. BARNARDO, THE FATHER OF "NOBODY'S CHILDREN." By W. T. STEAD. *Review of Reviews*, August 1896.

THIS work began thirty years ago with Dr. Barnardo's efforts to better the lot of twenty-five homeless boys in London, and now 5000 boys and girls are cared for in the various Barnardo Homes. By this great system of relief more than 30,000 of the class called by Mr. Stead the "Don't-live-nowheres" have been provided with homes. The article is illustrated from photographs of various groups of children who are now inmates of these Homes.

THE OTHER END OF OUR EDUCATIONAL PROBLEM. *Scribner's Monthly*, July 1896.

ONE cannot have had any experience of the instruction of European boys and girls without being conscious of the radical contrast between the spirit of the elementary schoolroom abroad and in this country. There is among the little people abroad a peculiar sort of application of which among American children you will find not the smallest trace. It is not a question of industry. The juvenile American is as willing to learn and as quick about it as any other. It is a matter of mental attitude. The schoolroom where European children acquire the rudiments of education is, in some unanalyzable way, a quieter, remoter spot; one more shut off from the distractions that come from without, and, notably, more serious. Learning may look to the youthful minds within those walls to be a dull thing, but it is certain, without their being aware of it, to seem a dignified thing.

OPPOSITION TO THE GRANTING OF OXFORD DEGREES TO WOMEN. *The Educational Times* [London], November, 1895.

THE following petition against the granting of the Oxford degree of B.A. to qualified women has been forwarded to the Committee of Congregation appointed to consider the matter. It has been signed by one hundred and three members of Congregation.

I. The undersigned members of Congregation desire to call the attention of Council (1) to the doubts which exist as to the advantage which would result to women's education from allowing them to proceed to the degree of B.A., and (2) to the effects which may ultimately ensue to the constitution of the university and the working of its examinations by the admission of women to this degree. They respectfully urge that the questions involved in the proposal to allow women to take the degree of B.A., are of a serious and

fundamental character, and are not yet ripe for solution, and that the proposal should not at present be submitted to Congregation.

II. At the same time they hold that some further recognition should be accorded by the university to women students. They therefore ask that this recognition should take the form of a university diploma, stating the course of study in which the student has qualified. They do not desire that the diploma should be confined to those who shall take the course prescribed for the B.A. degree, but that the latitude at present allowed to women students in this respect should be continued. Whether the receipt of this diploma should be conditional on residence, they leave an open question for the present.

Another twenty-five members of Congregation have signed the first part of this petition, ignoring the second part.

WOMEN AT THE ENGLISH UNIVERSITIES. *The Journal of Education* [London], February 1896.

THE two ancient universities are both on the eve of a bloodless revolution. Merlin is musing in the wild woods of Broceliande, with Vivian at his feet, and (who can doubt it?) will end by yielding and telling her all the charm, but in this case the victory will have been won by no witchery "of woven paces and of waving hands," but by virile logic, by the irresistible force of the *Zeitgeist*. To give the kernel and still refuse the shell, or to hold, as Professor Sidgwick once held, that the honors course is suitable for women, but the poll course unsuitable, is hopelessly illogical or wildly paradoxical. It is seen, moreover, that the further questions involved in women's degrees — their admission to fellowships, professorships, lectureships, and a share in university administration — may be safely left to settle themselves

THE ROYAL COMMISSIONERS. *The Journal of Education* [London], November 1895.

AT the last monthly meeting of the College of Preceptors there was a goodly gathering of ladies and a fair sprinkling of gentlemen attracted by the prospect of hearing about the Royal Commission from a Commissioner himself. The title, however, of the lecture was delusive, and should have run "Side-lights on the Royal Commissioners." Each of his sixteen colleagues was portrayed by Dr. Wormell with a few rapid strokes, kindly, but not without the satiric touch. Mr. Bryce was the model chairman, a keen and clear intellect, proof against fatigue, with a power of incisive speech, expressing with equal lucidity both his own views and the views of others which he could not or would not understand; a Scotchman nourished on deductive philosophy and impatient of any preliminary examinations of fact as an unnecessary waste of time. Dr. Fairbairn, another Scotchman, a subtle and conscientious metaphysician, great on the Dick Bequest but knowing

nothing of the conditions of success of English secondary schools, strongly opposed to the representation of teachers both on the local and central authorities, at his best among the woods of Bolton Abbey, "when he led us into the inner and deeper problems of education than those that could be mooted in the Council Chamber of Westminster." Mr. Jebb, the *fine fleur* of Cambridge Scholarship, the Admirable Crichton of the Commission. Mr. Lyttelton, the representative of cricket and the public schools, "a second head-master, yet there was no overlapping, for he knew as little of the schools with which I am connected as I do of cricket and public schools." Mr. Llewellyn Smith, a sort of Royal Statistician, with a profound belief in statistical tables, "only he likes to make the tables himself." Mr. Sadler, the originator of the Oxford Congress, a stout and gallant champion of teachers "as will be seen by Memorandum No. 5." The Dean of Manchester, "a moderator and peace-maker — we were not allowed to speak of diverting, converting, or perverting an endowment, but accepted the colorless term 'verting." Mrs. Sidgwick, endowed in full measure with the powerful intellect of the Balfour family, "who showed me, as I had never realized before, what is meant by continuous study and close application."

EDUCATIONAL IDEALS.— *The Journal of Education* [London], February 1896.

IN the midst of all our discussions as to the administrative details of secondary education, we naturally lose sight, for the time, of the more important question of what should be the nature of the education to be given. Mr. Gow, in demanding his Board of Studies, is like a voice crying in the wilderness; and Mr. Findlay's very valuable and suggestive memorandum on American schools is in danger of being overlooked. In Scotland, where the report has not aroused so much practical interest and discussion as it has in England, we find a more enlightend consideration as to questions of curricula. In a recent number of the Scotch *Educational News*, Mr. James Oliphant, a member of the Edinburgh School Board, contributes a very luminous article on the extent and basis of science teaching. He is at one with Mr. Herbert Spencer as to the need of scientific studies, but differs from him as to the reason. That is to say, his ideal is different, and it is just upon the ideal that the success or otherwise of our teaching depends. We venture to think that Mr. Oliphant is a stage ahead of Mr. Spencer, and on a level with Professor Jebb, in basing all teaching upon "humanities" and not upon "utilities." "The real end of life," he claims, is the free enjoyment of ideal beauty in sympathy with our fellow creatures."

Mr. Spencer's classification of the activities of life is, no doubt, historically correct; but, now that self-preservation, maintenance, and care of offspring are practically gained for the mass of the people, his last class, the "gratification of the tastes and feelings," becomes the most (and not, as Mr.

Spencer asserts, the least) important. "The paramount aim of education," Mr. Oliphant continues, in a pregnant paragraph, "is to persuade children that the secrets of life which make it worth living are revealed to those only who travel on the paths of knowledge and right conduct." The truth is that school-work is divorced from life. We must, to a great extent, modify our curricula. We must get our teaching in real touch and sympathy with life itself, and not with one academic side of life. There can be little doubt that the present examination system has much to answer for in making a teacher's work conventional, dead and unreal. Nor is this evil confined to schools. A well-known professor in Edinburgh spoke the other day of the difficulty of finding a student who read for knowledge's sake. And the same would be true of our own universities.

But having said all this, we come — we trust in no captious spirit — to the enumeration of matters where our note must necessarily be of another character. We should have liked our first comment to have ended, as it began, in one continued note of congratulation. But the proposed constitution and functions of the local authority render this impossible. As to the constitution, we agree, generally, that a body elected *ad hoc* is more or less impracticable, however much as a counsel of perfection we should have desired it. So we accept the composite body as inevitable — with a reservation respecting the counties. But why take the County and Borough Council as the foundation upon the fabric is to be erected? In the counties of course the reason is more obvious than in the boroughs; there is no county educational administrative body covering the whole area as there is in the great bulk of the boroughs. Why not *create* one of the counties, compromising with our disinclination to add to the electoral machinery, by utilizing existing agencies in the boroughs? A general board of education in each county would be the making of rural education in all its branches. As it is, from our point of view, the finding of the commission on the county authority problem is most unsatisfactory. Of course, managers of the elementary schools may, and probably will, be coöpted upon the county authority. But surely, if it were necessary to take specific steps to secure representation of the university colleges, there was greater need to see that the management of the elementary schools should on no account be omitted. The more so since one of the recommendations of the commission is to develop secondary departments in some of the rural elementary schools.

Then again, in the boroughs we complain that the School Board is not sufficiently recognized. It may not be competent as a rule to add to its present duties the control of secondary education, but it would have been as easily possible to add other essential components to the School Board as to throw the School Board in as an equal constituent with Town Council Committee. In London, the position is even worse. Out of a new authority of forty-two members, the County Council is to send eighteen, Oxford and Cam-

bridge two, and the School Board seven members. With prophetic foreboding the commission suggests the prospect of revision in this department.

But if we have dwelt at length on the constitution of the local authority, it is not because its proposed functions are to be deemed satisfactory. On the contrary, the extent to which the secondary and technical education of the future is to be locally controlled *apart from the primary school* is far and away the chief blot upon, in most respects, an excellent production. Our readers know our views on this matter, and to this crucial point, which raises the very pinch of the problem of the future national education, we shall of course return again and again. Meanwhile, there can be little doubt that a strong endeavor will be made by the local authorities for primary education to put the thing on the right lines. They will get an opportunity in determining to resist the invitation to give up their higher grade and organized science schools, and we have no doubt they will rise to the occasion.

In connection with the financial proposals of the committee, we object most strongly to the diversion of the £100,000 now dispensed through the medium of small endowments to the elementary schools — unless, of course, this money is expended in provision of secondary departments of the elementary schools which now enjoy the endowment. No educational endowments, small as they are, are doing better work or are more needed. We should like, further, to know definitely what science and art grants are to be diverted, for let us at once say that the primary schools want all they now receive and more. Although the commission does not fear the result, we think the cause of technical education must suffer from the general appropriation of the whisky money for the purposes of secondary as well as technical education. We are sorry for this, because the secondary education the worker's child is distinctly technical, modern, and commercial.

It is not necessary to say that there is much fruit for the most serious contemplation on the part of the ardent educationist in the pages of this interesting and weighty report, and from time to time between now and the pleasure of the government it will be our duty to elaborate criticisms and comments on special points. Meanwhile, parting company as we are bound to do with the majority of the commission in respect of the recommendations affecting the local authority, its constitution and its functions, we nevertheless most heartily congratulate all concerned upon the production of a splendid contribution to the discussion in this country of the question of secondary education.

AN EFFECTIVE ORDER OF TOPICS FOR TEACHING PHYSICS[1]

THE conclusions which are intended to be met by this plan are the following:

1. We should teach physics as we would teach anything else that is worth

[1] From a privately printed paper, by Mr. Charles F. Warner, Cambridge, Mass.

knowing—for its own sake and with the same enthusiasm that every good teacher feels in awakening an interest in truth for truth's sake. Physics is really an interesting and useful science, even to a high school pupil. Let us not allow our zealous devotion to the scientific method to kill any natural desire of our pupils to know something worth knowing.

2. We ought to recognize the peculiar fitness which our science certainly has as a training ground for the mental faculties,—training in careful and methodical habits of work, in skillful use of the hands, in observation and reasoning, in scientific methods of investigation. This is the peculiar feature of the laboratory; and it must not be forgotten that individual work is the main thing here and that it must be carefully watched to have it valuable at all. But we may give all the training by means of our laboratory courses that is possible and yet fail, if we do not give something else also. We must furnish a great fund of information. Already the dead languages, because they have been taught for discipline, have lost in relative value among school subjects and will be saved, it is thought, by teaching more of their literature. If physics is taught for training only, it will need to be rescued from a similar decay.

3. There is no reasonable basis from the pedagogical point of view for separating physics for training from physics for its own sake, and no necessity in the nature of the subject for this division. Of course it must be admitted that there is a wide difference between a lecture or text-book method and a laboratory plan, both in the subjects best suited to each, and in the manner of presenting them. The point which I would make is this, that this natural difference of quality does not necessitate any alternative, either partial or complete. It is not necessary to adopt the whole of either one, to the exclusion of the other, nor, indeed, to place special emphasis upon either one, to the detriment of what is especially valuable in the other. Both methods may be combined, and still retain those distinctive features which give them their peculiar value. The field of physics is broad enough to furnish subjects suited to laboratory treatment, which are of practical value in themselves, and if the fruit of a considerable number of laboratory exercises is purely training, they can afford, in exchange, to yield some time to the consideration of those theories and principles which cannot be handled entirely by individual teaching, in the secondary schools at least, but which are of practical interest to all pupils, whatever their destination.

4. We ought to encourage reading and thinking about the theories of modern physics. The theory of the constitution of matter, the cause of the pressure of gases, the meaning of energy, its correlation and transformation, the ether with its gravitation, its heat, light, magnetism and electricity, I have found intensely interesting to most of my pupils; and they are boys supposed to have a bent toward practical things rather than matters of theory.

5. There is danger of making an unreasonable attempt to reduce all

laboratory work to a quantitative basis from the desire to obtain results in a form suited to a fixed plan for recording. To assist in making proper records, a certain quantitative form may be given to exercises which are really qualitative. From general educational considerations it is best to introduce the study of physics by bringing the pupil into close acquaintance with the interesting phenomena of the science. This work of introduction ought to cover the entire subject in a measure, and include very little, if any, quantitative work. The pupil should be given a general view of the elementary principles of the entire subject before entering upon any rigorous exercises, for three reasons,—first, the easier work is often the more interesting, second, the less exacting exercises are not entered upon with respect after doing work of a higher grade, and, third, the true spirit of quantitative investigation cannot come to the young student until he knows enough of the science, as a whole, to enable him to see the place which the results of the work he is given to do may have in the general system. Not until a general view of the entire subject has been obtained, can quantitative work be entered upon seriously and pursued with safety. A great practical advantage in this arrangement is that the advanced exercises may be graded according to their difficulty without much regard to the sequence of topics, inasmuch as the general subject is under review. This obviates the necessity of following some difficult exercise with easy ones, for, having once set a standard of accuracy, our course should be so planned as to favor living up to it.

6. The pupil should be led to discover things for himself whenever it is possible to do so. He should at the same time be protected from aimless experimenting. He should be taught to test rather than to verify. His experiments should therefore so far precede text-book reading and class discussion as to give him a fair chance to be scientific if he can be. This applies to the elementary qualitative work as well as to the later and quantitative exercises.

7. Laboratory teaching, both qualitative and quantitative, needs to be supplemented by the careful use of text-books and books of reference. A fair division of the time is two-fifths in the laboratory, two-fifths in class-room work, the remaining one-fifth being devoted to tests, and occasional lectures on special subjects.

OUTLINE OF TOPICS IN PHYSICS GRADED FOR EFFECTIVE TRAINING

NOTE.—About two hundred and fifty ordinary school periods are required to cover these topics in the manner outlined. Much less time is needed when the laboratory teaching can be conducted on the double-period plan. The course may be shortened to bring it within the compass of a school year by omitting the more difficult exercises, without losing the general view of the subject. Considerable variation in the order of topics is admissible and, indeed, desirable in adapting it to practical con-

ditions, if it does not go so far as to disturb the general plan. Some of the easier quantitative exercises may be appropriately distributed among the qualitative experiments in the first four sections of the course.

Experiments described in Italics are thus emphasized as suitable for laboratory treatment.

I. PROPERTIES OF MATTER

(Statement and discussion aided by concrete illustrations)

Explanation of terms: Experiment; apparatus; manipulation; matter; body; general properties.

Most Evident General Properties and Conditions of Matter: Mass (distinguished from weight); extension (resulting in size or volume); impenetrability (*with experiment on impenetrability of air*); divisibility; molecule (limit of physical divisibility); porosity; compressibility and elasticity (distinguishing four kinds of elasticity — viz., after (1) compression (2) bending (3) stretching (4) twisting); states of matter (*a*) solid, (*b*) fluid (including liquids, vapors and gases); molecular motion (statement of theory of constitution of matter).

Molecular Forces: Molecular distinguished from molar forces; cohesion (involving adhesion); specific properties of matter: (1) tenacity (2) hardness (with experiment to compare several minerals according to Mohr's scale of hardness) (3) malleability (4) ductility (5) elasticity (perfect, imperfect, limit of), involving brittleness, flexibility, toughness and the processes of tempering and annealing; (6) viscosity (7) structure; surface tension (involving capillarity (with practical illustrations and experiment to determine the cause of capillary action; diffusion (with two optional experiments — one free diffusion, the other, osmosis).

Practical Questions: (Calling for explanations of phenomena pertaining to the foregoing topics).

II. SPECIAL PROPERTIES AND PHENOMENA

(Treated qualitatively)

HEAT: Sources (sun, fixed stars, chemical change, molecular motion); medium of transmission, ether; temperature; general effects of heat upon bodies,—(*a*) expansion, (EXPERIMENT, *Gravesands, ring or expanding bar moving index;* EXPERIMENT, *expansion of* (1) *water and* (2) *alcohol;* EXPERIMENT, *air thermometer;* principle of thermometers (involving a description of the construction of thermometers, and comparison of Fahrenheit with Centigrade scales); (*b*) abnormal expansion and contraction of water (practical illustration); (*c*) fusion and (*d*) vaporization (EXPERIMENT *to observe effect of solids in solution upon boiling point of liquid*); EXPERIMENT, boiling water in exhausted receiver; effect of pressure on boiling point; principles of evaporation; dew-point; EXPERIMENT *to determine the dew-point;* distillation (*experimental illustration*); transmission of heat (*a*) by conduction

(EXPERIMENT *to observe conduction through rods of copper and steel and through water*) (*b*) by convection (EXPERIMENT *with water and air;* principles of ventilation; (*c*) radiation (experiment with heated metal ball).

Practical Questions: (On phenomena connected with foregoing topics).

MAGNETISM: Historical notes; EXPERIMENT *to observe the general properties of a magnet;* definitions, (1) poles, (2) polarity, (3) equator, (4) axis, (5) consequent points, (6) induction, (7) retentivity; compass; EXPERIMENT *to observe the action of the poles of one magnet upon those of another;* the magnetic field; EXPERIMENT *to examine the field of magnets under various conditions;* magnetism of the earth; EXPERIMENT *to investigate the evidences of the earth's magnetism;* magnetic observations: (1) magnetic equator (2) magnetic poles (3) magnetic meridians (4) isoclinal lines; magnetic charts; deviation (1) local (2) on iron ships (3) methods of correction.

ELECTRICITY: Historical notes; static and current electricity distinguished; EXPERIMENT *to observe some of the evidences of electrification;* theory of electrification (involving discussion of ether); conductors and insulators; effect of neighboring charge upon an insulated body (1) polarization (2) bound and free electrification by influence; the electric field; the electroscope; the electrophorus; EXPERIMENT *to investigate the distribution of electrification upon insulated conductors* (1) *when found on hollow conductors,* (2) *effect of shape,* (3) *effect of points;* condensers: EXPERIMENT *with the electric pane;* PROBLEMS *requiring an explanation of the action of the plate machine and the influence machine;* potential; electro-motive force; current; EXPERIMENT *to observe conditions for voltaic current;* chemical principles involved and Grotthuss' theory; EXPERIMENT *to observe behavior of compass as an evidence of current;* the galvanometer; amalgamation; polarization; varieties of cells; EXPERIMENT *to observe how current is affected by nature* (resistance) *of conduct involving effect of* (1) *length* (2) *size* (3) *material of conductor;* the units ohm, ampere and volt; Ohm's law (*problems showing advantages of* (1) *arc and* (2) *series arrangement of batteries*); EXPERIMENT *to observe the arrangement of cells in arc and in series to form batteries;* EXPERIMENT *to observe the general effects of electricity* (1) *heat and light* (2) *electrolysis* (3) *electro-magnet* (4) *field of a wire in circuit* (5) *effect of live helix on a magnet; current and magnetic induction;* EXPERIMENT *with primary and secondary coils;* extra current; thermo-electric current; *Applications:* (1) telegraph (2) telephone and microphone (after lecture on sound) (3) shocking coil and spark coil (4) dynamo and motor (5) electro-plating.

SOUND: Condition of a body when emitting sound (practical illustration); medium for transmitting sound vibration (*practical illustration and reference to experience*); nature of wave movement explained; terms defined (1) crest (2) trough (3) wave-length; nature of sound waves (*experimental proof*); sound a sensation; mechanism of the ear; velocity of sound; reflection of sound waves (echoes); interference and re-enforcement of sound waves

(*illustrative experiment with tuning fork and resonance jars*); nature of the vibrations of a sounding body (*illustrations with sonometer*) (1) nodes (2) antinodes (3) ventral segments (*further illustrations with rods, plates, and columns of air*); the three properties of sound distinguished (1) pitch (2) intensity (3) timbre; *experimental proof of the cause of pitch* (*Savart's wheel and cardboard siren*); intensity dependent on (1) amplitude (2) distance (3) density of medium; timbre dependent on composition of sounds; harmonics (1) of strings (2) of plates (*illustration*); analysis of complex sounds by Helmholtz resonators (*illustration*); the musical scale; beats, discord, harmony; the vocal mechanism; the phonograph.

LIGHT: Radiation by means of ether; theory of ether waves; light defined; ray, beam, and pencil defined; terms (1) luminous (2) illuminated (3) transparent (4) translucent (5) opaque defined; EXPERIMENT *to observe images through apertures*; shadow and section of shadow and penumbra (*illustrated by experiment and by diagrams*); velocity of light; (Roemer's method explained); EXPERIMENT *to observe magnifying by pin hole*; visual angle and apparent size of objects; EXPERIMENT *to observe and state law of reflection*; diffused light; EXPERIMENT *to observe and describe images formed by plane mirrors* (involving a diagram); multiple reflection (diagrams to account for observations); EXPERIMENT *to observe and describe reflection from curved* (cylindrical) mirrors; reflection from concave spherical mirrors described with definition of terms (1) principal axis (2) secondary axis (3) vertex of mirror (4) center of curvature (5) principal focus (6) conjugate foci; *Problems to locate images of points in various positions*; real image; virtual image; images in convex spherical mirrors; EXPERIMENT *to observe and describe the refraction of light*; theory of refraction; EXPERIMENT *to observe total reflection*; lenses (1) converging (2) diverging; terms defined (1) principal axis (2) secondary axis (3) optic center (4) principal focus (5) focal length (6) conjugate foci; *Problem to locate the image of a point in various positions; Problem to draw diagram of real image: Problem to draw diagram of virtual image; practical illustration of decomposition of white light by prism*; theory of decomposition of white light; chromatic aberration; explanation of the rainbow: *Supplementary lectures on special subjects. Suggestive questions on optical instruments.*

III. THE MECHANICS OF FLUIDS

(Qualitative experiments and discussion)

Nature of fluids (involving comparison of gases and liquids); transmission of pressure by fluids; application in hydraulic press; EXPERIMENT *to investigate the relation of pressure to depth in water*; EXPERIMENT *to ascertain what the amount of pressure upon a given surface depends upon*; surface of liquids in connected vessels; EXPERIMENTS *to investigate the pressure of the air* (involving use of air pump); discussion of fluid pressure (atmosphere

described); barometers; elastic force of gases; EXPERIMENT *to observe the action of the siphon;* the siphon explained; the air-pump; the air condenser; the suction pump; the force pump; *Suggestive problems.*

Note.—The Principle of Archimedes and the work in Density and Specific Gravity is deferred in this plan until the practice in measuring and weighing is begun. But it might come here without seriously disturbing the order.

IV. THE MECHANICS OF SOLIDS

(Experiments, somewhat quantitative in character, and discussion)

Matter always in motion; inertia; action of force described; equilibrium of forces; measurement of force; graphical representation of forces; EXPERIMENT *to investigate the conditions for equilibrium for two forces;* EXPERIMENT *to investigate the conditions for equilibrium of three forces applied at different points in a body and not having one and the same line of action;* EXPERIMENT *to investigate the action of three forces that meet in a point;* EXPERIMENT *to investigate the conditions for equilibrium of three parallel forces; Problems in composition and resolution;* motion of translation and rotation; movement of a force defined; EXPERIMENT *to investigate the principle of moments;* cause of curvilinear motion; centripetal force, tangential force and centrifugal tendency; applications; the principles of gravitation with numerical illustrations of the law; theory of the estimation of mass by weight; center of gravity (mass); EXPERIMENT *to locate the center of gravity of several bodies;* EXPERIMENT *to investigate the conditions which give rise to three different kinds of equilibrium; Suggestive problems;* acceleration; laws of falling bodies; illustrative problems.

V. WORK AND ENERGY

(Discussion and illustration)

Work described and defined; energy, kinetic and potential; various examples; transference and transformation of energy; examples; unit of work and energy; formulas for estimating work and energy; conservation of energy; Joule's equivalent; power; *Problems.*

VI. MACHINES

(Experiments, discussion and problems)

The relation of machines to work (experimental demonstration with pulleys); general use of machines; general law of machines; special laws (1) of the lever and its modifications (2) of the inclined plane (experimental demonstration); suggestive problems.

VII. MEASUREMENT OF THE FUNDAMENTAL PHYSICAL QUANTITIES

The Measurement of Length and the Estimation of Surface and Volume: The units of length (1) English (2) metric; EXERCISES *in use of the metric*

rule with precision; line measure and end measure; the diagonal scale; EXERCISE *in use of diagonal scale;* the straight vernier; EXERCISE *in the use of the vernier;* EXERCISE *in reading barometer vernier;* rules for significant figures in computations; metric units of area; *Examples in computation of area;* metric units of volume; *Examples in computation of volumes, practical demonstration of the relations existing between similar surfaces and solids and the like dimensions;* estimation of the area of irregular figures (1) method of ordinates (2) method of weights; EXERCISE *in use of method of ordinates;* measurement of volume by displacement; EXERCISE *to test the accuracy of readings from the graduated tube;* EXERCISE *in use of the graduated tube in measuring volume;* EXERCISE *to determine the relation existing between the volume of a sphere and its circumscribing cylinder;* EXERCISE *to graduate a pipette for ordinary use;* units of angular measurement; EXERCISE *to practice the approximate graduation of a circle.*

The Measurement of Mass and the Determination of Density and Specific Gravity: Mass redefined; mass compared with weight; English and metric standard units of mass and weight; comparison of masses by inertia (illustrative exercise); rules for the use of the balance (1) zero point (2) arrestment (3) manipulation of weights (4) collecting results; weighing by counterpoise; double weighing; EXERCISE *in use of the balance* (1) *by ordinary method* (2) *by counterpoise* (3) *by double weighing* (*results compared*); definition of density (1) absolute (2) relative; EXERCISE *to investigate the density of brass, steel, and cherry;* EXERCISE *to investigate the effect upon the weight of a body produced by the liquid in which it is immersed;* formulas for finding specific gravity (1) of bodies that sink in water (2) of bodies that float (3) of liquids; EXERCISES *in determining specific gravity* (10 *to* 15 *materials*); specific gravity of soluble substance; floating bodies; hydrometers; specific gravity flask; EXERCISE *in use of hydrometer and specific gravity flask;* EXERCISE *to determine density of floating body from its degree of immersion;* specific gravity of gases; *supplementary exercises in specific gravity determinations by other methods* (optional); *numerical problems.*

The Measurement of Time: The standard units of time; time-keepers; the simple pendulum described; EXERCISE (*preliminary*) *to observe the conditions affecting the time of vibration of a simple pendulum;* EXERCISE *to determine the length of a seconds pendulum;* EXERCISE *to determine the relations between the time of vibration and the length of a pendulum; numerical problems.*

VIII. QUANTITATIVE EXERCISES

(Arranged in order of difficulty according to suggestions made by Mr. Chase of the Cambridge Latin School.)

1. Breaking Strength of Wire.
2. Elasticity (*a*) after stretching.

(*b*) after bending (optional).
(*c*) after twisting (optional).

Questions suggesting practical applications

3. Coefficient of Friction.
4. Action and Reaction.

Questions suggesting practical applications

5. Photometry — (Rumford's or Bunsen's method).
6. Focal Length of Convex Lenses.
7. Conjugate Foci of " "
8. Radius of Curvature of Convex Lenses. (Use of spherometer.)

Questions suggesting practical applications

9. Pitch of Tuning Fork.
10. Wave-Length and Velocity of Sound.

Questions suggesting practical applications

11. Testing Thermometers.
12. Coefficient of Linear Expansion of several Metals.
13. Expansion of Gas.
14. Boyle's Law.
15. Pressure of a Gas due to Heat.
16. Specific Heat of several Solids.
17. Latent Heat of Melting Ice.
18. " " " Steam.

Questions suggesting practical applications

19. Pulling Force of a Magnet.
20. Distribution of Magnetism (vibration method).
21. Electrical Resistance (substitution method).
22. " " (bridge method).
23. Measurement of Current (electrolysis).

Questions suggesting practical applications

24. Weighing by Vibrations.
25. Sensitiveness of a Balance.

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